THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

General Features.

In the absence of anything startling in the domestic iron market, it may be refreshing, even if not reassuring, to look abroad. From all of the leading iron trade centers of Great Britain continue to come reports of an active market, especially in steel rails and plates. The exports of steel rails from the United Kingdom in March were 73,643 tons, as compared with 50,308 tons in March, 1888, and 44,779 tons in March, 1887. The bulk of these went to South America, Australasia, and British India. The totals for the first quarter of the year, however, show a slight falling off. The countries taking less rails this year than last are: Spain, Italy, Japan, the United States, Mexico and British Columbia. The utmost activity in railroad-building prevails in the Argentine Republic at present. On the Continent, the general aspect of the iron markets continues to give hopes of a prolonged period of at least relative prosperity. The trade of France, it is true, is languid and depressed, but there are symptoms of returning life. Belgian trade is animated by a spirit of confidence that keeps the market firm in tone. In Germany there is a constant and steady development of the home trade. The latest advices are to the effect that there has been a notable accession of strength to the syndicate of rolled iron manufacturers from the reception into that association of no fewer than seven of the outside firms. This has resulted in a corresponding increase in demand for rolled iron. The activity on the Continent affects both crude and finished iron and steel. Statistics of the French blast furnaces show a total yield in 1888 of 1,688,976 tons. Turning to the American iron trade, we find the same conditions existing as heretofore reported. Aside from a slight spurt in coke, last week, there was nothing to relieve the general monotony. The receipt of more liberal orders for coke from Eastern anthracite furnaces caused a temporary cessation of price-cutting, but it is not considered safe to regard this as a permanent advance. The production of coke last week was 98,727 tons, against 91,221 tons for the previous week. As the June convention of the Amalgamated Association of Iron and Steel Workers approaches, there is renewed talk as to the probable action in regard to next year's scale. The sentiment among the iron-workers is that the present scale will be adopted with but few changes, and presented to the manufacturers for their signatures. Thus far the iron operators are non-committal as to what they desire, or what course they will pursue. Sales of steel rails are nominal, at prices heretofore quoted. The only transaction of any importance, the past week, was the sale of 15,000 tons, by a Pittsburgh mill, to the Louisville and Nashville Railroad. It is understood that there are inquiries in the market from Southern roads for about 20,000 tons.

Iron Ore.

The disagreement as to ore prices, which for at least a month has seriously interfered with sales, seems to have come to a head and a very few days will suffice for ripening of the storm. On one side are arrayed the ore producers, on the other Mr. Carnegie and his kindred interests. Some weeks ago the ore dealers, while making no combination, met and talked the situation over. The result of that conference was a general understanding to sell only at a living profit. Ore quotations were held off accordingly, and for a time the furnace-men were on the anxious seat. Some sales have been made, but the quantity covered, beyond that taken subject to market prices, is small. The ore men are firm and Mr. Carnegie's friends report him to be in fighting trim against the ore interests. It is alleged that with cheaper lake freights the ore men are having undue advantage, and, by way of testing the ore dealers' position, some furnace-men, who are known to purchase none but standard ores, have bought small lots of inferior ores as a sort of feeler. One Youngstown furnace firm, for instance, has taken 10,000 tons of a $3.50 Marquette ore which it really does not want and which it will have to dispose of at a loss. Of the ores sold, the low-grade ores have taken the lead, and even here the producers have shut down on sales and are holding their stocks for better prices. Furnace-men, while anxious to buy, are yet afraid to enter the market lest a decline in ore quotation should set in which would leave them losers, while their more cautious competitors could afford to buy at the cheaper rate. In any event, the situation is likely to be dictated by the consumption of the enormous quantity of pig stock now held, and while the furnace-men will not haggle about ore prices when iron is selling well, ore producers cannot reasonably expect a lively trade until there shall be a prospect for turning the pig material now piled up in the yards into money. It is rumored at Ironwood that the West end of the Aurora mine is not looking well and will not produce any ore this year. Formerly the open pit supplied the majority of ore shipped, but now shafts 1, 2 and 3 are bottomed in soap rock and the season's output may be correspondingly reduced. The Aurora has now 60,000 tons of ore in stock piles. As will be seen by figures elsewhere, the total amount of iron ore on dock at Lake Erie ports, at the opening of navigation this year, is 558,753 gros tons, as against 703,720 tons on dock at the opening of navigation in 1888—a decrease of about 21 per cent. The Winter shipments from the lake fronts to the furnaces were 1,289,802 tons, an increase over the Winter shipments of 1887-8 of more than 50 per cent. Ore men will, no doubt find considerable comfort in these figures.

Pig Iron.

A sale was reported from Pittsburgh, last Friday, of a large quantity of first class mill iron, on four months' time, for $14 a ton. If this be true, it is the lowest price paid for iron in that market for several years. At Louisville, several large transactions are on the point of being closed, provided furnaces will sell for deliveries desired. There is no change for the better and prices remain low, with little prospect of a speedy advance. The policy of consumers appears to be, as fast as they make contracts, to cover with purchases of iron, so that when the real advance takes place, they will be benefitted by it. A steady, constant demand at Cincinnati betokens a liberal consumption, and there is considerable talk of a certain favorable reaction, but the general feeling is still languid. St. Louis reports the usual amount of iron as being consumed, and stocks in buyers' hands gradually diminishing. The market remains quiet, but a better demand is looked for soon. Prices are unchanged. At Chicago it is thought that buying, in the aggregate, is more liberal than for some time past. There is, however, no change in the tone of the market, which, on the whole, is weak and dull. Any indication that a turn in the market is finally at hand would lead to heavy covering for future wants. Lake Superior charcoal iron is hanging fire, buyers evidently believing that lower prices will come by further waiting. Furnaces, however, claim that it is poor business to consume their limited wood supplies in making iron to sell at cost, and that further concessions mean wholesale blowing out.

Merchant Iron.

Rolling mill business is looking a trifle better, and demand for mill iron is fair. Agricultural implements shops are busy and are looking for large crops.

Foundry Work.

Local foundries complain somewhat of dullness and unsatisfactory prices. Stove men speak of the Spring trade as very light. The leading Western pipe works are full of orders and melting heavily.

CUBAN IRON ORE AGAIN.

The IRON TRADE REVIEW's recent article on Cuban iron ores and their relation to the Lake Superior ores in American markets, has called out an interesting rejoiner by the Marquette (Mich.) *Mining Journal*, which we print elsewhere in full. In substance, the *Journal* holds that, at the cost of mining and transportation figured by Mr. Thomas Haskins Graham, of Philadelphia, the present tariff on iron ore will no longer be protective as to the native product, when shipments of Cuban ore fairly begin, and that, consequently, the remedy is not a fight for cheaper rail rates from lower lake ports to Pittsburgh and the East, but an advance in the tariff, sufficient to reach the prohibitive point. Without entering into a discussion of this phase of the question, the IRON TRADE REVIEW calls attention to the following statements, derived from authentic sources, as to the present status of the American investments in Cuba:

The iron range lies at the southern extremity of the Island of Cuba, about four miles from the coast and parallel thereto. The first American investors to begin the development of mines, as is well known, were the Pennsylvania Steel Company and the Bethlehem Iron Company. The shipping port for their ores is the town of Santiago de Cuba, 20 miles distant from the mines, a railroad now being in operation between the two points. The latest purchase of Americans lies to the Westward of the Jaraugua Company's mines and is described as literally a mountain of iron. It lies only four miles inland, and the projectors propose to save the longer rail haul by constructing a line of railroad directly to the coast. For the purpose of affording ample harbor protection, they are now constructing an extensive breakwater, after plans furnished by Major L. C. Overman, United States Engineer. All of the capital will be furnished from, and all the machinery, rolling, stock, etc., will be purchased in the United States, so that this will be a distinctively American enterprise. The present owners of the property are Messrs. George H. and S. P. Ely, of Cleveland, widely known to the iron ore trade, and, indeed, to the entire iron and steel trade of the country. Mr. S. P. Ely is now in Cuba, and is expected home within a week. Concerning the richness of the ore and its adaptability for steel-making, there is no question. We have seen samples of it which bear a striking resemblance to the best Lake Superior Bessemer ores, analyses showing from 65 to 68 per cent. of iron, with no sulphur, and with the percentage of phosphorus far within the Bessemer limit.

The relation which this enterprise will sustain to the general iron ore business is entirely legitimate and cannot be open to criticism among fair-minded men. It is in no sense anti-American. Its projectors are, and have always been, staunch supporters of an American protective tariff. To Mr. George H. Ely, more than to any other one man, is due the fact that the present tariff of 75 cents per ton was enacted, rather than 50 cents, as was proposed at the time. If the Messrs. Ely choose to invest their money in Cuba, and put the product of their mines in the markets of the world, whether in England or the United States, no one can consistently object, so long as they pay our duty, whatever it may be, and do not seek to have it lowered.

A SHIP CANAL TO PITTSBURGH.

The Pennsylvania Legislature finally thought well enough of the proposed Lake Erie Ship Canal to pass the resolution authorizing the Governor to appoint a committee to survey routes and report on the feasibility of the project. The commission is to consist of three civil engineers, who are to make a survey and report at the next session of the Legislature. What route will be advised is, of course, unknown, but Representative Brown, the author of the resolution, who has given the matter considerable study, thinks that the one by way of the Beaver river through Lakes Conneaut and LaBoeuf to Lake Erie will prove the most advantageous, as being the shorter. Another route suggested is by way of the Allegheny river. However, the main question is fairly before the public, and the report will be looked for with interest.

The day has gone by when ship canals are to be considered behind the times. The great Manchester Canal, now in course of construction in England, is a standing proof to the contrary. The Nicaraugua Canal is only delayed; it will never be abandoned. The Michigan Ship Canal is bound, sooner or later, to come. So far as the proposed Lake Erie and Pittsburgh project is concerned, it presents no engineering difficulties that cannot readily be overcome. Nor is the financial aspect of the case as serious as might at first be thought. The Suez Canal cost a little less than $100,000,000. Its profits in 1872 were $410,655; in 1883, $4,507,650; in 1887, $3,048,600. Its receipts the first year were $3,667,025; in 1883, $13,320,934; from the beginning to the present time, about $125,000,000. In 1875 it paid its first dividend, $146,543; in 1883, its dividends amounted to the enormous sum of $4,950,000. It has now a surplus of about $30,000,000. The par value of its shares is $100. In 1871 they were worth only $33; in 1882, they rose to $710, and their average value from the beginning has been $419. It has paid its shareholders in dividends $7,728,252, or 7½ per cent. yearly on their original outlay. Yet the annual tonnage is not as great as that of our own St. Mary's Falls Canal. As to the business to be done by such a canal, we can only refer to the fact that last year the railroads tapping Lake Erie ports carried to the Mahoning Valley, Shenango Valley and Pittsburgh furnaces more than 2,500,000 tons of iron ore, not to speak of the large quantities of coal conveyed to the lake for shipment to the Northwest.

CONDITION OF THE HARDWARE TRADE.

From full and reliable reports to the *Iron Age*, concerning the condition of the hardware trade throughout the country, we condense the following: In New England the first two months of the year were quiet, but the resumption of building operations has stimulated demand, and the outlook is good. Crops are promising, and farmers are correspondingly more disposed to purchase. Some interior points are suffering from railroad discriminations, the result of the long-haul clause of the Inter-State Commerce Act. Stocks are not large, but are well assorted. Prices are low.

In the Middle States, business is in a generally satisfactory condition. Merchants are, as a rule, carrying light stocks, and buying cautiously in the expectation of lower prices, but there is nothing discouraging in the situation. In the larger cities of Pennsylvania, building operations are very active.

In the Central Western States, there seems to be much activity, though, perhaps, not quite the volume of business reported last year. The reports from Ohio are especially gratifying. While the low prices ruling for farm produce will curtail building in rural districts, the extensive building operations in the larger cities and towns will more than make up for this, and, on the whole, the outlook is very encouraging.

Throughout the Northwest there is a very hopeful feeling, although Wisconsin reports are not of an especially encouraging nature, on account of bad crop conditions. The increasing tide of immigration is constantly opening up new markets, and there seems to be good reason for hope that it will continue.

A COMING AMERICAN INDUSTRY.

We admire the frankness of the Welsh tin-plate manufacturers, as shown in their reasons for not entering into the proposed tin-plate syndicate. It was not because they had any particular objections to combining and establishing artificial prices, but because they feared that American iron and steel manufacturers would combine to have the tariff raised. As this would cut off the the market for three-fourths of the product of the Welsh mills, which now comes to America, they decided not to go into the arrangement. But will this strategic movement assist them? Maybe so. But there is a spirit of prophecy in this recent remark by Mr. O. W. Potter, President of the North Chicago Rolling Mill Company, which does not bode well for our friends across the sea: "I am perfectly sure that we are a great deal nearer to the making of tin-plate in this country than most persons are aware of. If we shall not be making tin-plate within five years I am greatly mistaken. We have everything in the world to make it of. It is not necessary that we should follow the same method of making tin-plates as is followed in Wales. I think that we can cheapen the process of manufacture. We will be making block tin in the United States within eighteen monhts. Persons who are engaged in that work say now that they will be ready to make block tin by the time we are ready to roll tin-plate. That will not be for at least twelve months."

MACHINERY MEN HAPPY.

A recent trip through Western Pennsylvania and Central and Western New York, by a representative of this paper, showed that in engine, boiler, and machinery manufacturing lines there is the utmost activity. During January and February, trade was dull, but with the opening of Spring has come a large and increasing demand from the West and South. This is, in part, the result of the introduction of the policy of establishing agencies in those sections, and manufacturers express themselves as hopeful that the rush will continue through the Summer. The demand for power comes from all branches of industry, and extends, not only to the South, but also to the Pacific Coast. One large engine manufacturing concern is 30 engines behind orders, and another reported only three small engines in stock. If

anything, the inquiries are coming more largely from saw mills and flour mills. Wood-working machinery of all kinds is in great demand.

FUEL GAS UNDER THE BOILER.

BY CHAS. EVANS.*

A cheap process of manufacturing gas is not all that is required for the success of a fuel gas company. Appliances for its use are necessary, appliances to take the place of any fixtures now using solid fuels, that are simple in construction, yet durable, combining beauty with cheapness, and, above all, constructed to allow of a perfect combustion and utilization of the gas. I believe it to be a mistaken idea that it is necessary to adapt the coal furnaces, stoves, etc., to the use of gas. For forty years the manufacturers of coal stoves and furnaces have been trying to perfect their goods to consume coal, and get the best results. Why should we attempt to burn a gaseous fuel in competition with a solid, and use the very instrument that makes our competition a close one, and retards our progress? Let us see how mixed gas at 30 cents will compare with anthracite at $6 per ton for heating purposes. Assuming the coal to have a calorific value of 13,000 heat units per pound, and burning it in the best constructed furnace of the day, which realizes 20 per cent. of the fuel used; the equivalent of the unit of heat in warming air is 52.5 cubic feet raised one degree Fahr. Assuming a store room to contain 20,000 cubic feet of air, and that the entire air be changed every hour, and the temperature be raised from 20°—an average winter's day—to 70°, it would require in round numbers 457,200 heat units, or 1,428 cubic feet of gas each 24 hours; this at 30 cents per M=$42\frac{84}{100}$ or $12.85 per month of thirty days. Anthracite coal to accomplish the same results in heating would require 176 pounds per 24 hours, or $52\frac{8}{10}$ cents, or $15.80 per month; a saving of 18 per cent. in favor of gas, as well as saving of labor in handling coal. In the generation of steam, when cheap coal can be used, a fireman supplies the coal under the boiler in proper quantities, at proper intervals, the result would be much in favor of coal. For instance, it requires to vaporize one pound of water from 50° Fahr. to steam, 1,128 units of heat.

The evaporation of 8 pounds of water per pound coal is readily obtained, with a good boiler, and would mean a utilization of 70 per cent. of theoretical heat units of the coal. On an evaporation of 8 tons of water it would require 2,000 pounds of coal, or $2.50 for fuel, if it be of good quality. Let us see how near gas at 30 cents per 1,000 cubic feet can approch this. To vaporize 8 pounds of water would require 28 cubic feet of gas, and to evaporate 8 tons it would be necessary to consume 56 M cubic feet or $16.80 for gas. In this, of course, I have not figured in the labor for firing the boiler, but even then the cost of fuel gas at 30 cents per M would place it practically out of the field in competition with cheap coal for generating steam in large quantities. But, this difference can be overcome, if the manufacturer will put in a private gas generating apparatus; for he will be able to produce gas at a price that will materially change the figures quoted in favor of gas. But fuel gas has an enormous field outside of the generation of steam, and in this it has met with marked success at Jackson; 450 families are using it for cooking, heating and lighting, and 50 stores and business places for lighting and heating. The heating is not confined to heating small rooms and offices; large stores and even churches, can, and are being heated at a cost satisfactory to the consumers. For the production of power, by the use of the gas engine fuel gas has a field that no competition can undermine. Small manufacturers will not be obliged to put in a boiler and engine, hire an engineer, and pay extra rates of insurance on his goods on account of having a boiler in his establishment. Or in lieu of this he might locate near a large manufacturer and hire his power, but that would mean to locate in a quarter of a city where high rents are demanded. With the gas engine he may run his business on any street where the companies' mains are, and receive his power at a total expense of gas, oil and water, of 1¼ cents per hour per horse power.

*Manager Jackson National Gas Light & Fuel Co., Jackson, Mich. Extracts from a paper read before the Ohio Gaslight Association.

THE HISTORY OF IRON-CLAD NAVAL VESSELS.

CHICAGO INTER-OCEAN.

The idea of strengthening the sides of vessels with iron to resist attack originated with the Normans in the twelfth century, who put an armature or belt of iron around their vessels, just above the water line. The crusaders of the twelfth and thirteenth centuries protected their ships in a similar manner. Pedro of Aragon in 1450 had the sides of his vessel covered with leather or rawhide, and the Knights of St. John covered their vessels with plates of lead. In 1782, at the time of the siege of Gibralter, a French ship-builder made ten floating batteries with bomb-proof tops, their sides protected by parapets six feet thick, made of hard wood, leather, and bars of iron. These batteries withstood heavy artillery fire, at close range, for several hours, and finally only yielded to red-hot shot. In 1814 Robert Fulton offered to construct a floating battery, for the United States Government, which should be proof against the heaviest guns. This vessel was not completed until after the close of the war. It had no plating, but its battery was protected by a wooden wall. It was never used in war, and was destroyed by the explosion of its magazine in 1829. The name of this vessel was *Fulton the First*. *Fulton the Second* was a vessel built in 1838, whose wooden walls were protected by a thin plate of iron.

The suggestion of plating ships with iron was brought forward in both France and England about this time. It is really impossible to name any single person as the first inventor of iron-clad vessels. The idea was the natural outgrowth of the improvements made in artillery, which demanded more effective means of resistance; the inventors, therefore, were those persons who, in different nations, gave the idea form and feasibility. In 1842 Robert L. Stevens proposed to the United States Government the construction of iron-clad steam batteries for the defense of her ports. After some experiments as to the strength required, the construction of one battery was decided upon, and it was begun in 1854. The inventor of this vessel died, however, and it was never finished. Between 1830 and 1850 both the English and French governments made many experiments to test the power of iron plates to resist projectiles, but no attempt was made to secure any practical results from these tests until the Crimean war. It was then found that the English and French war ships drew too much water to get within close range of the forts of the Baltic, and, therefore, a number of iron-plated floating batteries were constructed by order of the French. The first of these vessels was launched in March, 1855, and, as it proved very useful for the purpose intended, the British Admiralty, the following October, also gave orders for the construction of several similar vessels.

The French were the first to follow out the idea that had thus proved so successful, and at Toulon, on March 4, 1858, under the orders of Napoleon III., the work of building an iron-plated screw frigate of the first-class was begun. This vessel, the *Gloire*, did not differ essentially in shape from other wooden frigates, except that her bows were made to converge to a point, so that she could be used as a ram. Her armor consisted of solid plates of iron, 4½ inches thick, and only covered her sides amidship. The construction of this ship marked an epoch of the greatest importance in naval warfare, as from that time wooden ships were doomed to give way to armored vessels for all purposes of warfare. While the *Gloire* was in process of building the French laid the keels of the *Normandie* and *Invincible* on the same plan, and soon after of other vessels.

The British Government, understanding these movements of the French navy as a direct challenge against the long-vaunted supremacy of Great Britain on the seas, immediately undertook the building of a fleet of still more formidable character. The admiralty, therefore, ordered the construction of four iron-plated vessels, the *Warrior*, the *Black Prince*, the *Defense*, and the *Queen*. These have since been followed by the construction of vessels of even greater strength, so that now Great Britain has an iron-clad fleet of formidable strength and numbers. Similar fleets have also been made by the French, Austrian, German, Italian, and Russian governments; indeed, there is no government, either in the Old or New World, that has not a navy, or a portion of a navy, of iron-clad vessels.

Up to the time of the civil war in the United States all efforts of constructors had been given to the building of vessels after the old patterns, simply using iron in place of the outside covering of wood, but after the famous *Monitor* came on the scene it was perceived that important changes of form in the building of vessels must be tried.

The first iron-clads used by the United States in warfare were some built early in 1861 by Captain James B. Eads, on the model of the "turtle-back." They were wooden vessels of the usual shape, plated with iron slabs two and one-half inches thick and eleven inches wide, rabbeted together, and laid on a four-inch backing of oak at an angle of about forty-five degrees. These vessels were by no means impenetrable to the fire of heavy guns, but they did good service.

In the latter part of 1861 Mr. Ericsson brought to the War Department his plan for an iron-plated revolving turret ship. It was accepted, and Mr. Ericsson received orders to build a vessel immediately. This he did, completing it in 101 days, and on its first trial trip it was sent to Hampton Roads, arriving there just in time to save the entire United States fleet from being destroyed by the rebel ram *Merrimac*. The essential feature of this vessel was a revolving turret, composed of wrought-iron plates, bolted together to a thickness of eight inches. The hull of the vessel was also of iron. All the navies of the world now use monitors and turret ships to some extent. Steel is now largely used instead of iron for the armor of vessels, and the thickness of this protection is sometimes, as in the case of the great British warship *Inflexible*, made of a thickness of twenty-four inches.

Booms and Bonuses.

In strong confirmation of the IRON TRADE REVIEW's recent remarks on the evils of "Booms and Bonuses," is the statement made at the recent meeting of the Ohio Gas Association by Mr. Eugene Printz, Superintendent of the Gaslight Company, of Zanesville, that he had found that most of the manufactories that have moved from towns where they formerly used coal, for the purpose of using natural gas, were manufactories that were run down, and had but very little business in their own towns. They were also bankrupt, and they would take advantage of offers of land and buildings and a certain amount of money to locate in certain towns, and in many cases they have lasted but a little while after they moved to new towns. That's about the size of it.—[IRON TRADE REVIEW.

This is rather sweeping, and while it is unquestionably all true in many instances, it is only partly so in others. The fact is, strict attention to business and the avoidance of all kinds of outside entanglements will invariably assure success in any and all lines of manufacture in the old established centers, the prosperity and widely extended prestige of which were firmly and permanently established long before natural gas was known. And it may be remarked that plenty of manufacturing establishments still remain in these old coal-endowed centers, whose managers seem to be amply satisfied with the business they are transacting, and they have but little confidence in "rolling stones" or extraordinary mushroom inducements.—[Ohio Valley Manufacturer.

FRANCE claims the honor of utilizing a higher water pressure than that recently put in operation in the Chollar shaft on the Comstock lode, in Nevada. At Brignoud two kilometers from the valley of Gresivaudad, near Grenoble, a turbine 9 feet 10 inches in diameter was put in operation in the year 1875, utilizing a head of 1,638 feet. It is still working and gives a force of 1,500 H. P., with a flow of 300 litres of water per second.

AMONG THE IRON MINES.

Menominee Range:—

The *Current* reports the shaft down about seventy feet at the Aragon, and sinking going on satisfactorily. The compressed air receiver was put into place recently, and a new 120-horse power steel boiler has arrived. The drill hole near the foot of the hill is down 225 feet and in slates.

At the Southeast Vulcan, the ore shows up well, and a new exploring shaft which has been sunk on the north lens of ore (about 300 feet north of the shaft) is now down about 80 feet, and 15 feet in a fine grade of blue ore. This shaft will be continued until the footwall is struck before any opening is done, and it may be that a large lens exists.—[Current.

The biggest hoist ever made out of one shaft (C shaft) in the Chapin mine since it was opened, was made on Tuesday, with Billy Sims at the engine. During ten hours 628 tons were hoisted, or an average of about 62½ tons an hour, which is considered the largest lift during the same period in any mine in the State of Michigan.—[Menominee Range.

The Mastodon is shipping all the ore for which cars can be procured. Stoping has been commenced in the open pit, and from 80 to 100 tons per day are being hoisted and dumped directly into the cars, while the shipping is being continued. The underground work is going on satisfactorily, and the Mastodon will probably send out between 75,000 and 80,000 tons during '89, and if it be found necessary, there seems no reason why a greater output may not be attained. Secretary, Treasurer and General Manager, Joseph Austrian, was at the mine a few days ago, and seemed pleased with the outlook. The officers of the company elected at the annual meeting a few days ago are the same who served last year.—[Current.

Some surprise has been expressed at the predictions of the Range that the Chapin mine would ship this season 500,000 tons of ore. This is a large figure, and the most careful predictions are always liable to failure of realization, but the Chapin mine starts in under advantages over former seasons, in that navigation has opened earlier, the mine was never so well prepared to make a splendid record, and with a demand to warrant the effort we shall expect to see this season's output largely exceed that of any previous year. The report given last week came from what we believed to be a reliable source, and if the shipments don't reach that point we can't help it. The mine and its management certainly has our earnest wishes for the grandest things possible of achievement. The Chapin this season has the advantage of two roads to take its ore to market, and on the long dock on the Chicago & North-Western spur can employ 100 men unloading cars, while a good many cars a day can be loaded from their double pocket on the Milwaukee & Northern track. With the perfect system of handling the ore under ground, raising and handling it on the surface, the shipments are limited more by the possibilities of transportation than the capacity of the mine.—[Range.

Gogebic Range:—

The following circular was sent out April 22, to the stockholders of the Aurora Iron Mining Co.: "The company has discontinued the transfer agency in New York. Stock certificates which have heretofore been sent for transfer to the Mercantile Trust Co., should hereafter be sent to the Secretary at Cleveland, O. The general office of the company will be removed June 1st from its present location to the Perry Payne Building in Cleveland."

Dispatches from Ashland, Wis., April 29, state that the Aurora mine was on fire, with the smoke issuing from several shafts. Later advices state that the fire was extinguished with a loss of $30,000.

The following items are from the *Iron Spirit*, of Bessemer, Mich.:

The company formerly operating the Chicago property has been reorganized and the property will hereafter be known as the Sparta. The shaft is now down 70 feet, and work is being pushed ahead as rapidly as possible.

At the Dangler the shaft has passed down through the main dyke and a fine quality of ore is found on the foot-wall side of the shaft. The shaft followed down the foot to the dyke, kept the same general pitch through the dyke, but now, underneath it, the foot is set back—how much is not yet known—aud a good quality of ore lies on that side of the shaft. This is the only property on the range, to our knowledge, that has a shaft through the dyke, and we are pleased to see it show up so favorably.

Last week we visited the Washburn, and found them at the same old pastime, putting in new machinery. The machinery, or certain parts thereof, having been changed no less than half a dozen times, each change, as a matter of course, involving considerable expense beside loss of time—aud, we should imagine, a terrible strain on patience. The willingness of the management to thus test and try new machinery would, however, seem to point, to some at least, that were they not satisfied with the outlook they would hesitate a long time before sacrificing so much time and money. It could, therefore, be deduced from the general condition of affairs that the Washburn operators are well satisfied with the outlook, and are inclined to push on to the bitter end. The management seems to believe that they have at last discovered the right process for the treatment of the refractory ores at the Washburn, and as the mill will be in operation within a week or two, we shall, perhaps, be able to chronicle their complete success; we hope so at any rate.

At the Pilgrim the cross-cut to the south is now in over 400 feet, and still no foot-wall. The drift east and west along the strata of ore that was struck about 250 feet south of the shaft in the cross-cut are looking fairly well, but what the management want is the foot. They will then be able to locate themselves properly, and this they mean to get.

Work on the ne¼ ne¼ of section 22-47-43 is progressing favorably. The shaft is now down about 140 feet deeper than at the time of our last report, March 2d. It is still in a mixed ore, although the quality is improving as depth is obtained. The shaft is about 90 feet north of the quartzite foot-wall, and it will, without doubt, strike the foot before going much deeper, and it will then be continued along down at the same general dip as the foot. It is the intention of the operators to sink this shaft at least 240 feet, and they hope not without some considerable show of success—to strike something of value at that depth. There is no doubt but that the work is being conducted in a first-class manner, and we would like to see them successful in their venture.

Marquette Range:—

The Winthrop is producing about 500 tons daily, of fine quality ore, and with improvements now under way will soon be sending out 700 tons per day. Nothing presented can be of greater significance in determining the mine's worth than the amount of ore raised. At present writing a second skip road is nearly completed at No. 1 shaft, which will give two 2-ton skips to this outlook instead of one. This shaft is 8x16 feet inside of timbers. No. 4 shaft is at present sending out but little ore, only 20 to 30 tons a day, but will soon be in shape to furnish 200 tons daily. The Winthrop possesses a magnificent wealth of ore. Since the time the present management took hold a vast increase to the mineral stores have been made, the result of sinking No. 1, and opening drifts to the westward. Several hundred feet have been added in this direction. The Winthrop vein is made up of a series of lenticular ore bodies that have a general east and west trend and pitch to the north. These lenses are of various sizes, running from 20 to 50 feet in thickness and from fifty to several hundred feet in length. They are generally separated by from 10 to 20 feet of rock, and lap past each other. When the end of a lens is reached a crosscut is put in directly across the formation until the ore in the next lens is struck. There are now in stock at No. 1 shaft about 40,000 tons of ore, which gives an average of 65.12 per cent. of iron, an excellent result for a hematite ore. In the way of exploration, there is a shaft being sunk at a distance of several hundred feet to the south of the mine, and to the south of the diorite bluff. Some years ago a shaft was sunk 35 feet and some ore mined, but water drove the party out and nothing more was done.—[Iron Ore.

Vermilion Range:—

With the departure of the Missoula, and the Sitka which has arrived to-day, ore shipping from the Vermilion range for 1889 will have been fairly inaugurated, and she is the first of a long procession of great ships that will take from the docks an average of 25,000 to 30,000 gross tons of ore every week during the entire shipping season. Much of this ore is already sold, indeed a greater part is spoken for by Chicago and Eastern furnaces, and there promises to be little Minnesota ore on stock piles at lower lake ports next December. The mines begin shipping from stock piles aggregating nearly 400,000 tons, of which about 100,000 tons are Chandler and nearly all the rest at the Minnesota shafts.—[Duluth Herald, April 23.

Prof. N. W. Winchell, State Geologist for Minnesota, was in Itaska county, this State, last Fall, investigating the minerals of that region, and the result of his research seems likely to open up a new field of industry. Itaska county is comparatively unsettled, it being one of the northern counties, bordering on Manitoba; but before many years elapse there is a possibility that it will be a busy mining district, and that ton upon ton of ore will be taken from the earth to the benefit of the civilized world. According to Prof. Winchell, Itaska county probably includes both of the iron ranges of the State, the Mesabi range and the Vermilion range. These two rich ranges are not developed as yet, but the ore discovered is of a very good quality, and there is the likelihood of making big mines, employing many laborers and materially increasing the wealth of the State. The consummation so devoutly to be wished is more likely to materialize because of the Duluth & Winnepeg railroad, which, when completed, will penetrate this county, and will develop the perhaps unexpected richness of its resources. The iron found there is mostly of the variety known as the hematite ore, with more or less of the magnetite. One or two persons are already engaged on the Mesabi range in sinking test pits and even shafts, and have struck ore in encouraging quantities. The iron strata dip toward the south in this range. The Vermilion is farther north, but is unemployed so far as surveying is concerned; but the range has been identified in the valley of the Big Fork river. The Vermilion belt is likely to be from one-half of a mile to five miles in width. That is the width of the belt containing ore is apt to be this. The more southern range—the Mesabi—is much wider, and will probably extend 20 miles. Comparatively little has been done so far to develop what may prove a bonanza, other than to sink a few test pits and the 200-foot shaft. The discoverers are evidently waiting for the railroad facilities or else for capital to steep in and delve down deep into the mountain sides. Prof. Winchell seems quite sanguine that this is indeed a rich find. At all events, he is sure that there is a good deal of high grade ore in these two ranges, and anticipates a thorough and profitable development.—[Iron Tribune.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior for the season of 1889, up to Wednesday, April 25th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

Angeline, No. 1, Hard	2,695	Cleveland, Hematite	364	Republic Reduction Co.	2,023
Angeline, Sheffield	1,501	Cliffs, shaft	3,359	Superior	1,088
Angeline, Hematite	2,020	Marquette	334	Superior, Hematite	1,511
Buffalo, South	924	Pitts. & L. Angeline	1,686	Winthrop	6,158
Cambria	2,101	Queen	1,439		
Champion	12,236	Republic	10,869		
Total, Marquette Range					51,308

MENOMINEE RANGE.

Chapin	19,076	Florence	3,863	Mastadon	3,069
Commonwealth	1,736	Great Western	1,306	Monitor	396
Cyclops	721	Iron River	4,135	Norway	4,548
Dunn	2,559	Ludington	2,057	Vulcan	6,978
Total, Menominee Range					50,444

GOGEBIC RANGE.

Ashland	1,856	Brotherton	2,081	Norrie	17,034
Total, Gogebic Range					20,971
Grand Total					122,608

INDUSTRIAL SUMMARY.

New Enterprises :—

IRON AND STEEL.

The Star Iron & Steel Co., of Jefferson, Texas, has been incorporated with $1,000,000 capital stock.

The foundation for the new Wire Rod Mill, this city, is nearly completed, and it is thought that by the first of August the works will be in operation. About 150 tons of nail wire will be turned out every 24 hours. The New Castle Wire Nail works will use about 100 tons of the rods and the balance will be sent out of the city. The mill gives employment to about 200 men.—[New Castle (Pa.) Guardian.

A dispatch from McKeesport, Pa., near Pittsburgh, says: "The Monongahela Furnace Co., whose plant is to be located here, will, about May 1st, commence to transfer the works of the Edith Furnace Co., of Allegheny City, which it has purchased, from that place to the point where its plant will be built. This, in connection with the two immense blast furnaces to be built, will furnish employment for over a thousand men at the start. The capital stock of the company will be $1,000,000."

Among new corporations recently authorized in the State of Illinois are the following: Sampson Steam Forge Co., Chicago; capital, $100,000; for the manufacture of locomotive frames and general forging; incorporators, S. R. Wilson, F. J. Smith. J. W. White and F. J. Wilson. The Chicago & Minnesota Ore Co., Chicago; capital, $2,000,000; for mining, transporting, reducing and refining iron and other ores, dealing in securities, corporations, and other personal property; incorporators, Charles P. Coffin, Austin W. Grenville and Arthur C. Elis.

Carnegie Bros. & Co., Limited, of the Edgar Thomson Steel Works, at Braddock, Pa., are considering the question of erecting an additional blast furnace at that place, to cost in the neighborhood of $200,000. Furnaces A and Y will shortly be blown out for extensive improvements. A new converter and other appliances that are to be put in this Summer will considerably increase the output and cause a demand for more iron. This will make the erection of another furnace a necessity. At present the firm are operating seven blast furnaces at Braddock, six of which are running on Bessemer and the other on spiegel.

The National Forge & Co., of Chicago, have made arrangements to build their works at East Chicago, Ind., where they have secured a tract of 12 acres, with excellent facilities for rail and water transportation. The proposed location at Burnside was abandoned because of conflicting claims over the ownership of the land. The site now secured is in the immediate vicinity of the works of the Chicago Horseshoe Co. and the car works of the C. A. Treat, both of which are nearing completion. The machinery for the forge company is all under contract, and the erection of their buildings will be actively pushed in order to receive it as soon as it is ready to put in place.

MACHINERY, ETC.

Elmer Apperson is erecting a machine shop at Kokomo, Ind.

A $100,000 stock company will be charted to start an iron foundry and machine shop at Houston, Texas.

Incorporated: The Lone Star Iron Co., at Chicago; capital stock, $1,000,000; for the mining, smelting and manufacturing of iron; incorporators, John A. Kruse, P. J. Howard and E. P. Atfield.

The Davenport (Iowa) Cutlery Co. is a new corporation, lately organized and just about ready to start operations in the extensive manufacture of shears of all patterns and for all purposes. They have secured the services of L. A. Nickerson, late superintendent of the Rock Island Knife & Shear Co., and, with abundant capital and latest improved machinery, have fair prospects of success.

Enlargements, Additions, etc.:—

The capital stock of the Ajax Forge Co., Chicago, was recently increased $150,000.

A certificate was filed to record the increase of the capital stock of the Griffin Wheel & Foundry Co., Chicago, from $100,000 to $150,000.

The Center Furnace Co., Bellefonte, Pa., has increased its capital stock to $150,000, and it is understood will add a rolling mill to its present furnace plant.

Excelsior Manufacturing Co., Birmingham, Conn., makers of edge tools, will soon erect a new factory at Shelton, Conn. The new structure will be of brick, 280x40 feet and three stories high.

At a meeting of the stockholders of the Charlotte Iron Works Co., at Rochester, N. Y., a proposal was made to establish cast iron pipe works. Although the project has been regarded favorably, no definite action was taken in the matter pending another meeting, which is soon to be held.

It is stated that the Puget Sound (Washington Territory) Iron Works, at Irondale, will increase their capital stock, which is now $1,000,000, with the view of erecting rolling mills, to engage in the manufacture of steel and wrought iron in connection with their output of pig iron. The company, in their various departments, now give employment to about 400 men, but with the manufacture of steel and wrought iron they will keep about 100 more busy.

The Columbia Rolling Mill Co., at Jersey City, N. J., are progressing with their improvements and extension. They have just completed the erection of four reverberatory furnaces, a smelter, and the putting in of a 10-ton coal scale, and are sending out proposals for two 100-horse power boilers, 150-horse power engine, and the necessary machinery for running four pair of rolls, which, when completed, will greatly facilitate and increase their capacity for production.

Fires and Accidents :—

While pouring a heat to make a 4,000-pound casting in the foundry of William Tod & Co., at Youngstown, O., on the 11th inst., it exploded, hurling the molten metal in every direction. A number of the workmen were seriously injured, but no lives were lost.

The Standard Iron Works, at West Superior, Wis., have been destroyed by fire. Loss, $15,000; no insurance.

The new charcoal blast furnace of the Mont Alto Iron Co., at Mont Alto, Pa., was totally destroyed by fire April 30. The fire caught from the stack. The furnace was entirely new, and had been put into operation only two weeks ago. It was fited up with the latest improved engines, and was the finest plant in the country. It will be impossible to estimate the loss until the exten of damage to the engines and heavy machinery is learned. There is no insurance. Over 200 men are thrown out of employment.

Works Starting Up:—

The Brooke Iron Co., at Birdsboro, Berks County, Pa., has issued orders for the resumption of its nail factory, which had been idle for two months. It will employ 200 hands.

A press dispatch from Chambersburg, Pa., under date of April 11, says: "The Falling Spring Furnace here, which has been idle for five years, has been purchased by C. Burkhart & Co., who will put it in blast about July 1."

The furnace of the Jefferson Iron Works, at Steubenville, O., was blown in on Tuesday, April 9. It is 17 feet at the bosh and 81 feet in height and was erected by J. P. Witherow, engineer and contractor, of Pittsburgh. It was built to replace an old stack, and has a capacity of 150 tons per day.

Failures, Shut-downs and Wage Matters:—

The Plymouth Rolling Mill, of Conshohocken, Pa., have made an assignment to A. A. Lindsey, of the same place.

The employes of the Allegheny Bessemer Steel Co., at Duquesne, near Pittsburgh, about 1,000 in number, struck on April 16th for an advance in their wages to the scale paid at the Edgar Thomson Steel Works, at Braddock,

Advices from Joliet Ill., April 23, state that management of the Joliet Steel Co. has affected a final settlement with the Amalgamated Association of Iron and Steel Workers. The settlement was submitted to a meeting of the association last night and was ratified. It provides that the price for rail steel for 1889 shall be 10 per cent. less than the price paid in 1888. On soft steel, which the mill will be chiefly engaged upon for the year, there will be an advance of 5 per cent. over wages paid last year. The other minors of settlement are the same as in last year's agreement. The mills will resume operations May 6.

Great interest is being manifested among the nailers at Wheeling and vicinity over the announcement that the difference existing between the management of the Bellaire Nail Co. and the nailers have at last been settled. The new scale is a reduction of 12½ per cent. on fivepennys and larger, and 35 per cent. on all sizes under fivepennys.—[Pittsburgh Dispatch.

General Industrial Notes :—

Mr. Charles Himrod, of Messrs. Charles Himrod & Co., has been elected to succeed Mr. Dan P. Eells as president of the Calumet Iron & Steel Co., of Chicago, Ill.

W. G. Avery, president of the W. G. Avery Manufacturing Co., Cleveland, O., has received notice from the Commissioner of Patents for Canada, that a Canadian patent was issued to him April 2d, covering elevator buckets, welded, brazed and fused.

Saturday May 25, Sheriff McKinley will offer for sale at the court house at Warren, O., the undivided one-third interest of George Margerum, in the Falcon rolling mill property at Niles. The sale is the result of suits between the Commercial National Bank, of Youngstown, and the Warren Tube Co., and the same plaintiff and George Summers and others. Appraised at $8,000.

The plant of the Warren Tube Co., at Warren, O., which originally cost $150,000, was sold at sheriff's sale on Saturday, the 13th ult., to J. G. Barber, of Akron, O., for $35,000. It is reported that Mr. Barber represented the majority of the original stockholders, and the works are now practically in the hands of the builders. It is also stated that the plant will be put in operation at an early date.

Ship-building Booming.

Ship-building on the Delaware River is booming. The big Government contracts for ships for the navy divert some of the orders for merchant vessels to the smaller firms, and they are apparently all thriving.

Neafie & Levy have bought from the Gorgas estate a tract of land which doubles their water front, giving a frontage of at least 500 feet. On the upper end of the addition machine shops are being erected, and the lower end is being fitted with launch slips. The present capacity of this firm is four ships and a dozen tug-boats per annum, and with the new facilities the firm will be enabled to construct vessels of the largest size.

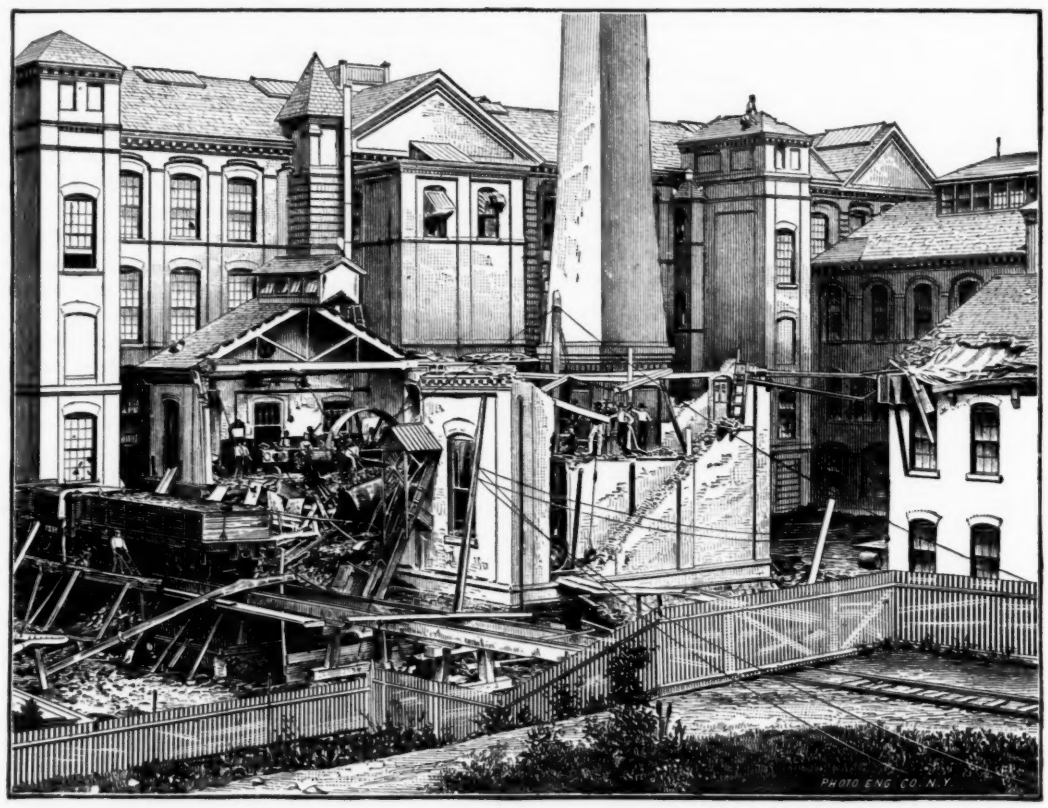
The present force of men is 500. In a fortnight 150 more will be added, and when the improvements shall be completed the firm will employ from 1,500 to 1,800 workmen. Government contracts have not been sought by Neafie & Levy, but the firm will soon be able to build war-ships.

Charles Hillman & Co. build wooden vessels for Neafie & Levy as well as themselves, and they, too, are busy. Additional shops have been erected to increase their capacity.—[Philadelphia Record.

An old experienced stove and tinware dealer in speaking of the changes and mutations in trade says: The small tin shops in large cities are now only repair shops. If to-day I was going to start a shop I would seek a frontier town, for that would be the only place that I could make money. A quarter of a century ago there was more profit in making $10,000 worth of tinware than there is in selling $50,000 worth of stoves to-day.

ANOTHER "MYSTERIOUS" BOILER EXPLOSION.

An explosion of a tubular boiler occurred at the Adelaide Silk Mill, Allentown, Pa., July 9, 1888, by which three persons were killed and several others were injured, one of whom has since died. The damage by the explosion was about $25,000. The exploded boiler was one of six, situated in a boiler-house as shown in our illustration, and is reported to have been only seven years old. It seems to have been the custom at this mill to spend a few days, at each Christmas and Fourth of July holiday, in examining the machinery and making whatever repairs were needed. The July stoppage and examinations had just been made, and the boiler-makers who had done some repair work, pronounced the boilers in good condition. For the accompanying cut we are indebted to the Hartford Steam Boiler Inspection & Insurance Co.



A SILK MILL AFTER A BOILER EXPLOSION.

THE ROMANCE OF THE FRENCH COPPER TRUST.

A friend highly competent in these matters furnishes the Paris correspondent of the London *Times* with the following account of the recent financial crisis there, and although some of the details may have been already published, the facts are so clearly stated that they will be read with interest by all those anxious to understand the misfortunes of one of the leading French banks.

Although the copper trade was a few years ago almost entirely in the hands of Englishmen, France, and more especially Paris, had both a direct and indirect interest in this article. The greatest copper mine in Europe, the Rio Tinto, which belonged to an English company, in which Bremen capitalists were also deeply interested, had at first to struggle with great financial difficulties. French capitalists had come to its assistance, and the Paris market took up at £2 a great part of its £10 shares. In 1881 the price of these shares rose to £30, the company having become very prosperous. The shares of the Rio Tinto, of which there existed 325,000 at £10, became one of the favorite speculative securities on the Paris bourse. Paris had not lagged behind, and the firms of E. Secretan and J. J. Laveissiere & Son, annually handled together from 25,000 to 30,000 tons of copper. By his contracts for copper cartridges with the French Government, M. Secretan had made a fortune, estimated at 40,000,000f. An art connoisseur, he had bought a mansion in Paris for 4,000,000f., and formed a celebrated collection of pictures, valued at from 10,000,000f. to 12,000,000f. M. Laveissiere chiefly devoted himself to copper sheathing, etc.

About ten years ago the two firms were amalgamated, under the patronage of the Comptoir d'Escompte, into a company called the Societe des Metaux, with a capital of 25,000,000f., in 50,000 shares of 500f., and with obligations amounting to 20,000,000f. The Comptoir d'Escompte, which thus aided in the company's formation, was one of the oldest French financial institutions, and until the last few days, one of the richest and most respected. Founded in 1848 by republicans, it remained under the empire a republican stronghold. Its general secretary was M. Edmond Adam, the husband of Madame Adam, who edits the *Nouvelle Revue*. Latterly M. Hentsch, a naturalized Swiss, and head of the firm of Hentsch, Lutscher & Co., and M. Denfert-Rochereau were at the head of it, the former as chairman and the latter as manager. The Comptoir had a capital of 80,000,000f., and 20,000,000f. of reserve. Its shares had for several years reached 1,000f., and even more, thus being at 100 per cent. premium, and they were considered a sound investment. MM. Hentsch and Denfert-Rochereau were also on the board of the Societe des Metaux.

M. Secretan joined the Societe des Metaux and the Comptoir d'Escompte, and admitted some leading Paris financiers into his circle of operations. A syndicate was formed, headed by the Societe des Metaux, and large quantities of copper were bought, the bankers supplying the funds. A large number of Rio Tinto and other shares were also purchased. The first results exceeded all expectations. Copper rose in a short time from £40 to £80, Rio Tinto shares from 450f. to 1,200f.

To strengthen the principal agent, the Societe des Metaux, its capital was raised to 50,000,000f., and its reserve fund was increased by 7,500,000f., by the creation of 50,000 new shares at 150f. premium. The Societe des Metaux then concluded contracts with all the copper mines willing to contract, the Societe engaging for three years—that is to say, to the end of 1890—to buy their whole output at a minimum price of from £60 to £65, half the surplus of the price of sale to go to the mines. In this way the Societe would have centralized about three-fourths of the present output of copper throughout the world—that is to say, it undertook to take 150,000 tons a year, involving an outlay of at least £9,000,000. But this was not all. In order to keep up the price and the monopoly it was necessary for the syndicate to buy all the output of those mines which had not agreed to contract.

As to the contract engagements of the Comptoir, no decision has yet been taken. The examination of its books showed the incredible way in which it had embarked in the copper speculation. It had 31,000,000f. of copper in warehouse. It had also advanced 73,000,000f. as a second mortgage, at the price of £44. In other words, its whole capital and reserve were embarked, one-third in copper and two-thirds in second mortgages on copper. It had, moreover, guaranteed for two years the contracts of the Rio Tinto, Tharsis and Cape copper mines, and it had engaged to take 80,000 tons of copper from £60 to £65, in case the Societe des Metaux did not do so—an engagement impossible of fulfillment by either concern.—[London Ironmonger.

HOW TO COLLECT.

There are many successful salesmen and few good collectors; yet the matter of clean collection is of more importance to manufacturers than heavy sales, as all discover soon or late.

The following was first published in an American paper and then in an English paper without credit, so we cannot give due credit to the original publisher:

"While it may take an artist to sell goods, the person who does the collecting should have a cheek that was made in a brass foundry. When a person buys anything he has to undergo a sort of inner struggle to make up his mind that the article in question is what he wants and something he cannot get along without. After this struggle is over, and the article has been charged, it is as hard to get him to pay as it is to do anything with plaster of paris after it has once set. The writer of the following rules must have been a bright and shining light in the collecting business. Particular attention is called to No. 12.

"1. Never give the idea that you called because you happened to be in the neighborhood.

"2. Never plead that you are in absolute need of the money.

"3. Never explain why you want the money, further than by some general phrase, as to meet outstanding bills. The debtor is usually an expert in showing a man how he can get along without money. He will worst you in argument, and if you lose your temper it is an excuse for him why he should not pay.

"4. Always be civil, however business-like and importunate you may deem it necessary to be.

"5. Never think you have done wrong because a debtor gets angry. His anger under civil treatment shows that he does not intend to pay. This you might as well know early as late.

"6. Show quite as firm a resolution to get the money on your tenth call as on any previous one, or else it would have been better if you had not made it.

"7. Never leave a debtor without his setting a time when he thinks he can pay, and never fail to be on hand at the time set.

"8. As between yourself and an employe, let the more business-like of the two make the dun.

"9. Suggest installments. Shame the debtor into an arrangement to pay something every week or month. If not $10, then $5, or $3 or $1. It will convince him that you have set to work in earnest to get the money.

"10. If a debtor gets angry, or has worn out your patience, a threat to attach his salary may be effective, not so much that he is likely to fear that you will get the money that way, as that he will be anxious that the affair shall not come to the knowledge of his employer.

"11. A similar effect may be produced by saying you intend to place the bill in the hands of a lawyer, particularly if you mention a lawyer whom he hates or who has a reputation for harassing debtors. Professional debtors, however, become careless about legal processes.

"12. Drop into a debtor's favorite haunts. It will make him uneasy, especially if you do not hesitate to ask him politely, but promply, for your money on occasion. This may happen after he has displayed a roll of bills."

F. VALTON reports in the *Genie Civil* that Alexander Pourcel has succeeded at the new basic open-hearth steel works of Bell Brothers, of which Sir I. Lowthian Bell is a member, in producing from Middlesbrough pig carrying 1.7 per cent. of silicon and as much phosphorus, steel with as low as 0.03 per cent. of phosphorus. The lining of the furnace is chrome ore.

BURY'S WINDOW VENTILATOR.

The Bury Patent Window Ventilator, herewith shown, is a strip of wood extending entirely across the bottom of the window, resting on the sill close against the sash, and is pierced with holes, near together, its entire length, on the outside and on the top, meeting at a right angle. Through these apertures, when the window is raised above the outside holes, the fresh air enters the room in an upward direction, without exposing the inmates to the draft. In Fig. 1, *a a* shows the sash, *b b* the window jambs, and *c c* the window sash. The cut represents the view from without, the ventilator being in operation. It is broken away at one end to show the sash raised above the outer holes to

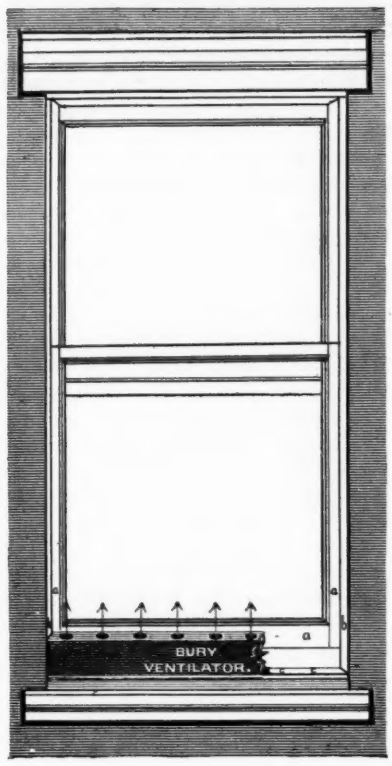


FIG. 1.

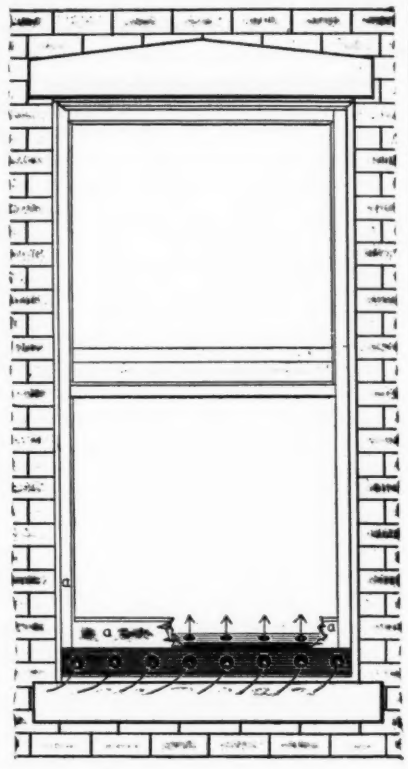


FIG. 2.

admit the air. Fig. 2 is a view from without, *a a* representing the sash. The sash is broken away to show the ventilator behind, with the fresh air passing in. The advantages of this invention, as found by actual test, are: That it affords an abundance of fresh air, without direct draft; that it is extremely simple; that the amount of fresh air can be readily regulated; that in driving rains the windows can remain open without fear of drenching, and that it is very reasonable in cost. Mr. Theodore Bury, 626 Euclid avenue, Cleveland, O., the inventor, will furnish all further information and fill all orders.

THE CUBAN ORE FIELD.

MARQUETTE MINING JOURNAL.

The Vermilion *Iron Journal* announces the departure, from Tower, of Capt. Elisha Morcom, formerly of the Menominee range, but of late Superintendent of the Minnesota Iron Co.'s mines at Tower, Minn., to take charge of the work of developing the Cuban ore deposit in which a strong American company is interested. The ore that this company is to mine in Cuba is to be shipped in this country, and will come into direct competition with American ore, so that the extent to which our ores are likely to be supplanted by the Cuban product is a question of living interest to the mine owners of the United States, and particularly to those of the Lake Superior region.

The IRON TRADE REVIEW, of Cleveland, has been looking into this matter somewhat, and furnishes the following facts and figures bearing on the subject:

The Cuban iron range, it appears, from the careful statements of Mr. Thomas Haskins Graham, of Philadelphia, is about 14 miles long, and lies only four miles from the Carribbean Sea. The ore as thus far shipped yields from 62 to 66 per cent. of metallic iron; 0.006 to 0.026 per cent. of phosphorus, and .02 to .04 per cent. of sulphur. The outcrops vary from 150 to 450 feet in width, and are composed almost entirely of ore. So much for the extent and richness of the deposit. Can these ores be imported to a sufficient amount, after paying the import duty, to seriously compete with Lake Superior ores? Let Mr. Graham answer.

Ocean freights from New York or Norfolk range from $1 to $1.75. Labor costs 80 cents per day. It is claimed that Cuban iron ore can be placed in Pittsburgh, duty and all charges paid, at from $1 to $1.25 less than the current rates for Lake Superior ores. Whether this claim has any basis, in fact, we leave to our readers to judge after reading the following estimate of Mr. Graham as to the cost of a ton of ore, duty paid, at New York, Philadelphia and Baltimore:

Mining	$ .75
Royalty	.30
Transportation	.15
Ocean freights	1.75
United States duty	.75
Administration and incidentals	.50
Total	$4.20

The present cost of Lake Superior Bessemer ore in Pittsburgh is about $6.75, and in the Schuylkill Valley it is from $7.25 to $8.25 per ton.

The duty of Lake Superior ore men is evident and immediate. No stone should be left unturned to secure a reduction of rail freights from Lake Erie ports to Eastern consuming points. It must eventually come to this, and the sooner the railroads realize it the better.

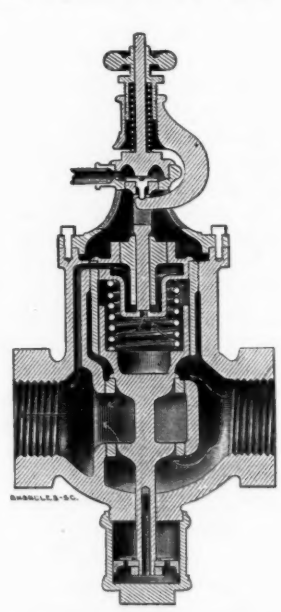
A study of the IRON TRADE REVIEW'S figures will not tend to reassure Lake Superior mine owners, who are hardly in a position to do much toward forcing the railroad lines between Lake Erie ports and the Eastern furnaces to make the concessions necessary to enable ores from this region to compete successfully with those from the field of ore supply in Cuba, under the conditions set forth by the Cleveland paper. The Lake iron mines cannot produce at a profit to their owners at a lower selling price than that now ruling, save by cutting the wages of their employes, and that is not to be thought of. No such cut in vessel and rail rates as would be required to put them on an equal footing with the Cuban mines for the purpose of supplying Pittsburg and Schuylkill valley furnaces, and others similarly located, is possible. With the tariff on imported ore as it now stands, therefore, there is certain to be a very large displacement of American ores by the Cuban product just as soon as the dispositions already made for the development of the Cuban deposits are given effect.

The tariff on ore was placed at a figure that was supposed to afford the mine owners of this country ample protection, and to enable them to meet competition from abroad without being forced to ask their employes to accept a standard of wages incompatible with decent living. It was adequate for this purpose when the competing fields of ore supply were on the other side of the Atlantic, but with such deposits as are said to exist in Cuba opened up at our very doors with the avowed purpose of forcing American ores out of a large and important section of the home market, a new condition of things confronts us. As the situation will be when the Cuban deposits are opened up, if the extent and quality of ore they produce are as claimed, the tariff of 75 cents a ton on imported ore will be no protection whatever to the American miners of ore against the Cuban ores in the greatest furnace districts of the United States. Considered with reference to a portion of the country where iron manufacturing is the most extensive industry, the day that sees the Cuban mines producing extensively will witness the protective principle nullified as to the American ore miners, and our ore driven out by an imported article.

Is there a remedy for this? Certainly there is, but it is not the one suggested by the IRON TRADE REVIEW. When the conditions forecasted in this article are brought about, the tariff on iron ore will cease to be high enough to perform its proper function, and should be brought up to the point where it will again become operative. That is the only remedy that will reach the trouble, and that is the one for whose adoption the Lake Superior mine owners and all concerned in the prosperity of the iron mining industry of this country should strike.

PUMP PRESSURE REGULATOR.

We illustrate in our columns to-day an improved pump pressure regulator, such as is now furnished by the Curtis Regulator Co., of Boston. This well known company has introduced many devices for controlling pressure of all kinds, and its constantly increasing business is a sufficient guarantee of the value of their devices, and of the public appreciation. The Curtis pump pressure regulator is an adaptation of their ordinary pressure regulator to the peculiar requirements of a pump pressure regulator, and is accomplished by



removing the phosphor-bronze diaphragm from contact with the steam, and placing it in the top of the regulator, extending the secondary valve up to meet it, and connecting the chamber over the diaphragm to the pipe or tank in which the water pressure is to be controlled, so that any change of pressure in the pipe or tank operates on the diaphragm, and closes or opens the valve placed in the steam pipe of the pump. In order that the valve shall have a gradual, smooth opening, a dash-pot is placed at the bottom of the regulator, the piston of which forms a part of the main valve, and effectually prevents any sudden opening of the valve (which might have an injurious effect on the pump), without in any way interfering with the sensitiveness of the regulator. The valve is placed in the steam pipe near the pump, and the union at the top is connected to the pipe or tank in which it is desired to maintain a uniform water pressure. Steam is let on to the pump, and the water pressure is regulated by turning down (or in) on the top handle of the regulator, until the desired water pressure is obtained. When once set at a given pressure the pump will maintain that pressure until the handle is changed, whether *much*, *little* or *no* water is used. Turning down on the handle will set the regulator at a higher pressure, and turning back will set it at a lower pressure. These regulators are in general use on hydraulic elevators, air compressors, sprinkling systems, hydraulic presses, straw works, paper factories, oil works, breweries and public buildings, water works, etc., and will perfectly control pressure on pumps for any purposes including vacuum pumps for steamships, sugar works and ice machines. They refer to the Worthington Pumping Engine Co. both of this country and London, the Deane Steam Pump Co., the Davidson Pump Co., the Barr Pumping Co., and many others who are using these goods.

OUR FUTURE MATERIAL WILL COME FROM THE GROUND.

BY PROF. J. F. ELSOM.

WRITTEN FOR THE IRON TRADE REVIEW.

There is no disguising the fact that with all the hue and cry that has been raised of the prospective user of paper, we gladly return to Mother Earth for our supplies for strength, durability, and ornamentation, even paper itself has to have some clay mixed with it for weighting and finishing. As the articles in preparation to follow this are to be devoted to the harder materials, and as clay—alumina—is the base, I will devote this article to clay and clay-working exclusively.

What a few years ago would have been considered bric-a-brac or curio, now may be found on sale in the shops at pricer far below ever dreamed of at the birth of the present decade. In terra cotta goods the changes in the character and improvements are almost beyond comparison. Manufacturers have become proficient in the science of polychromatic ornamentation, by the side of which the processes which vary the color of these goods without altering their strength, nature or general aspect whatever. Were I to suggest in tabular form these processes I should put them in four divisions, viz: changes or modifications in the elements out of which the various pastes are manufactured; the alteration of color during firing by changes in the application of heat; the use of particular colors and combinations on the surface of the goods, and subjected to certain influences after baking that will have a tendency to change by deepening or lightening colors.

The primary or essential constituents of clays are the relative proportions of silica and alumina they are known to contain. Granted that this relative proportion does not detract from the possibility of burning the goods to the desired color or shade, it is an expressive fact that the shade, of itself, is not an infallible criterion of quality. Again, we usually find more or less lime in clays; now lime of itself has no shade, being pure white, at the same time it is by no means an insignificant factor in imparting certain shades to the manufactured goods, and the same is true with reference to magnesia and many other sulphates generally found in clay deposits.

Subjected to close analyses we find that iron in the form of double oxide usually predominates in coloring substance of terra cotta, though manufactures are, to some extent titania, manganese, vanadium in the form of oxide, and arsenical preparations to a small extent. Pratically speaking, traces of the oxide of iron in clays mean a yellow or brown color to the goods, but is not the primary cause of the pink tint, as some suppose. The chemical reaction causing the change of color being the affinity the white of the silica and alumina has for the colored oxide of iron, the combination ensuing very energetically where heat starts their decomposition. Hence it follows that the proportion and condition of this oxide determines the depth of color. The action—chemical—of the other oxide will be referred to again furthur on.

It should be borne in mind in this connection that the character of the fire, together with the manner of its application, has a great influence on the depth of color. For instance, a very enterprising Buckeye manufacturer has experienced no little trouble in getting the desired color on goods made from clay, showing but small proportions of iron, but considerable lime. A sample tested and afterwards burned in the laboratory in a muffler where the heat was much greater than usually obtained in the kiln, particularly when wood is used for fuel, the small cube burned very dark, so much so that the gentleman asked if I had not used some color, but I did not, simply burned at a higher temperature, sufficient to form the double silicate of iron and lime, which is a dark yellow. With clays of this character, when burned at low continuous heat, will produce very light brick, while at an intense more rapid burning the goods will become dark in proportion as the temperature is increased. If our friends, who have so much difficulty with light or salmon brick, would observe this chemical reaction, use fuel where the fires are not easily applied, the salmon would be superseded by brown. Of course the fuel has an oxidizing influence also, and a brick or terra cotta clay, burning light with wood, will often be too dark with coal, petroleum or gas as fuel, something I am requested to discuss at another time.

With the manufacture of terra cotta, nearly all clays will produce a yellowish pink or reddish brown shades, and if kilns can be so arranged that the heat is under perfect control, and can be lowered or heightened at will, this is the best and most economical method of coloring. Now when the mixer of clays are made, samples of those previously burned should always govern the process, for the shade produced must be a tone between the various primary colors of samples. Thus, when lighter tones are desired, reduce intensity by means of clay that burns whiter. A writer, some time ago, in some paper, I have forgotten what name, said many good things regarding governing color, among which that yellow is easily obtainable by nearly all clays in their natural state, greater intensity being obtainable by means of ochres. Gray is obtained by mixing the dioxide of manganese with a white or yellow clay. Pink by many clays naturally, but can be deepened by the addition of red ochre to a clay which burns white, or a little kaolin to one that burns red.

Red and brown seem to be the favorite color of late, and scarcely anyone finds fault with too much of either. Nearly all clays produce red goods if burned properly, but if deeper hues than are obtainable in this way are desired the cheapest method of actuating is by the addition of cheap, low grade—"bog ore"—iron deposit which, I believe, may be found in sufficient quantity for the purpose within a short distance of any yard reached by the clay worker, and it seems to go everywhere, judging from the questions I get from my humble little card—I am very modest. The addition of manganese produces brown goods, especially to clays that burn red, the color can be so deepened as to produce nearly black goods, but manganese, unless found near by, which is not often the case, is rather too expensive with present margins of profit.

From the foregoing suggestions it will be seen that any color or shade in clay goods is easily obtainable, all that is needed, in the majority of cases, is the judicious mixing of colors, generally near at hand. The mud should, of course, be homogeneous to insure perfect and even colors, and when any mix, even of different clays, is made, each should be thoroughly pulverized previously, which is easily accomplished in the sun and a little labor.

Certain issolated cases and localities preclude the possibility of thoroughly mixing the colors and clays, particularly when a class of goods is called for that the color is very expensive or hard to procure. In such cases the goods can be successfully "plated" without detracting a particle from their quality. In such instances a thin layer of clay is applied, of the proper composition, to produce the color needed. But there are quite a few obstacles to surmount in the application of this process, the principal of which being the difference of shrinkage of the two clays, though this may be easily governed if time is taken to experiment a little, sufficient to obtain uniformity of shrinkage, and then work close to the formula. Then the propensity to cleavage must be overcome, best done by compression until the adhesion is perfect, working by this formula. All together is best produced by making each clay of precisely the same consistency; then the other requisites are compartively easy, it being understood, of course, the "plating clay" contains the coloring matters desired.

Burning is indeed important and I venture the assertion that more goods are damaged in burning than are the results of poor or unsuitable clay. A little more care in burning would produce a vast improvement in color. Let us look at the matter from a chemical standpoint. By the decomposing influences of heat alone the various oxides of iron found in clays are transformed sesquioxide or the protoxide condition, according as the fire exercises an oxidizing or reducing influence. *Look out, you patent kiln men.* In the former case the color is red, while the protoxide of iron is yellow, its distinguishing characteristic. To be sure this does not religiously apply to all clays, but does most emphatically to such clays as carry, what we are pleased to term, the proper proportion of iron. If clays are really rich in iron they will burn red any way, while having but very little will be hard to burn in a manner to produce goods of an intense red or brown, not withstanding the kiln may be a perfect oxygen generator. Again, it should be remembered that these oxides are volatile and when white goods are desired they must not be burned in the same kiln as the clay rich in iron, they will be discolored as sure as you do. I have had very fair success in coloring very white clay by burning in connection with very irony clays, but cannot recommend it practically. The kiln may be very uneven, for a large kiln with many hands and variable draughts and fuels is far different from a laboratory furnace with its many meters and everything under immediate control, and only one person present.

A Great Southern Corporation.

The annual report of the Tennessee Coal, Iron & Railroad Company, the largest coal and iron company in the South, for the year ending January 31, 1889, was made to the meeting of the stockholders, which was held on the 1st of April. The retiring president, Mr. Nathaniel Baxter, Jr., made the following statement in regard to the production of the different departments of the company:

DIVISION.	1887-88. Tons.	1888-89. Tons.
Tracy City, coal	426,274	413,631
Tracy City, coke	155,253	154,414
Cowan, pig iron	24,540	18,112
South Pittsburgh, pig iron	43,564	56,779
South Pittsburgh, coal	15,266	73,699
South Pittsburgh, coke	4,014	26,346
Birmingham, pig iron	41,056	47,770
Birmingham, coke	64,071	79,786
Pratt Mines, coal	718,824	888,247
Pratt Mines, coke	106,649	196,059
Ensley, pig iron	.....	78,089
Inman Mines, iron ore	107,750	126,271

TOTAL OUTPUT.	1887-88. Tons.	1888-89. Tons.	Increase. Tons.
Coal	1,160,364	1,375,577	215,213
Coke	329,987	456,605	126,618
Pig iron	109,160	200,750	91,590
Iron ore	107,750	126,271	18,521

Single Sheet Boilers.

Local boiler manufacturers are having occasional inquiries for single-sheet boilers, and the same are not prompted wholly by curiosity. Bids were actually asked for the other day on a boiler with dimensions of 60 inches by 18 feet, to be constructed of only two sheets.

The single-sheet boiler is not, by any means, something entirely new under the sun. It is in the nature of a new wrinkle out West here, but it has been known to the Eastern trade for, probably, half a decade. It comes from places of manufacture where boilers are turned out by the mile, to be sawed off in lengths to suit.

The single-sheet boiler, though, has some advantages to recommend it to the trade, aside from the inducements which its greater cheapness of construction and price offers. It presents a smooth heating surface, with no rivet-heads for scale to form about, and if not of too great a length is rigid enough. A row of rivets along the top of a boiler is never subject to scale formations. For small power purposes this type will answer as well as any; and it suggests the possibility of further evolution, until we shall come to the welded boiler finally. The latter is looked upon as a possibility by more than one practical man, seeing the constant improvement made in the quality and homogeneity of metal.

But it is not desirable to have a large boiler constructed of one or two sheets, for, if of considerable length, it would lack in both rigidity and strength. Again, if burnt, the repairs would likely be much more expensive than upon an ordinarily built boiler. Should the boiler bag, a great section of its length would be affected, whereas the common type of boiler would give only between the rows of rivets. In so far as either safety in use, or economy in respect of repairs is concerned, the thoroughly well riveted boiler is to be preferred all the time over the single or two-sheet affair.—[Age of Steel, St. Louis.

IRON ORE AT LAKE ERIE PORTS.

TWENTY PER CENT. LESS SURPLUS THAN LAST YEAR.

On Dock May 1, 1889, 558,753 Gross Tons, May 1, 1888, 703,720 Tons—Winter Shipments 1,289,802 Tons, or 50 Per Cent. Greater Than in 1887-8—A Rather Favorable Outlook for the Opening of Navigation.

In accordance with custom, THE IRON TRADE REVIEW presents herewith, from official sources, a statement of the amount of iron on dock at Lake Erie ports, at the opening of navigation this year, compared with previous years. For their promptness in wiring figures, we tender to the various railroad and port officials our sincere thanks. The subjoined table shows for each port the condition of the docks both at the opening and the close of navigation, for the past two years:

PORT.	Close of Navigation.		Opening of Navigation.	
	Dec. 1, 1887.	Dec. 1, 1888.	May 1, 1888.	May 1, 1889.
Toledo	50,000	53,254	19,200	15,000
Sandusky	65,000	100,000	50,000	35,000
Huron	11,700	9,250	8,381	2,377
Lorain	110,000	100,000	22,167	29,202
Cleveland	487,327	527,626	244,297	167,049
Fairport	223,318	250,000	80,000	50,000
Ashtabula	522,516	686,833	239,675	200,405
Erie	89,000	95,092	40,000	34,720
Buffalo	None.	26,500	None.	25,000
Total	1,558,861	1,848,555	703,720	558,753

Summarized, the situation can be expressed thus:

	Gross Tons.
On dock at Lake Erie ports, at the close of navigation, December 1, 1888	1,848,555
On dock at the opening of navigation, May 1, 1889	558,753
Total shipments to furnaces during Winter of 1888-9	1,289,802
Winter shipments of 1887-8	855,141
" " 1886-7	817,168
" " 1885-6	1,090,648
" " 1884-5	1,285,220
" " 1883-4	1,303,950

The Winter shipments for 1888-9 were 50 per cent. greater than in 1887-8, while the amount on dock this Spring is 20 per cent. less than a year ago.

The total amount of iron ore on dock at Lake Erie ports, at the opening of navigation, for the past seven years, according to THE IRON TRADE REVIEW'S figures, has been as follows:

Year.	Gross Tons.	Year.	Gross Tons.	Year.	Gross Tons.
1883	524,749	1885	556,657	1887	149,304
1884	388,739	1886	373,321	1888	703,720
				1889	558,753

The amount of iron ore brought down from Lake Superior last year was the largest in the history of that region, 3,783,659 gross tons, and the amount left on dock, at the close of navigation, was the largest reported in the preceding six years. As only 9 per cent. of the surplus of 1888 on dock was reported unsold, it is safe to say that all of this Spring's supply on hand has been placed on the market, and only awaits orders for shipment to the furnace yards.

IRON NOT YET OBSOLETE.

THE COLLIERY GUARDIAN, LONDON.

There is no question of greater importance than that of the merits respectively of iron and steel as materials of engineering construction. It is a mistake to suppose, as some persons do, that the dispute has been settled in favor of the latter metal. There have recently happened some noteworthy events to strengthen the belief that iron is by no means yet dispossessed of its inheritance of use. First, the increased output of iron-stone in 1888—as shown in the mining statistics just published—shows that theoutput of manufactured iron must be an increasing one. Then the decision of Lloyd's Committee with regard to the use of iron in ship-building, and the fact of the continued employment of iron for bridge construction, are proofs further of the tendency in question.

At the meeting of the South Staffordshire Iron and Steel Institute last Saturday a very suggestive discussion took place upon the value comparatively of iron and steel in boiler construction. The testimony of those who took part in the discussion was, as is usual in such cases, of a somewhat contradictory nature. While one set of disputants argued in favor of the use of steel for boiler plates, and stated its belief in the trustworthiness of this material, others speakers became eloquent about the refusal of certain steel-makers to use that metal in the boilers employed at their own works, and pointed to the large prices—as much as four hundred pounds in certain instances—paid for single boilers in the construction of which iron was exclusively used.

When metal makers differ it's difficult to decide. But the truth in this, as in many other arguments, lies probably in the middle. As was pointed out at the close of the discussion, both steel and iron will give excellent results when they are separatly used. When they are employed in conjunction in the same boiler, and when brass fittings are present, an electrolytic influence is brought to bear, which leads to corrosion of the steel. Again, when tie rods of manganese bronze and phosphor bronze and similar materials are used, electrolytic action is often set up, and the steel plates have been found to be corroded in proportion at those particular points. There seems to be no reasonable doubt that steel is more susceptible of corrosive action than is iron; but, on the other hand, the former metal has many virtues not belonging to the latter. For ourselves we do not believe there is that rivalry of the two metals which is sometimes spoken of. We expect to see the best Yorkshire and Staffordshire iron in no less request twenty years hence than it is to-day. The qualities of the two metals will gradually be shown up; but we do not expect to see either supersede the other. In the meantime it is worth while to remember that the injudicious combination of the use of iron and steel in engineering construction may produce sometimes disastrous results.

SECURING FOREIGN PATENTS.

JOURNAL OF USEFUL INVENTION.

The American patent law contains a special provision in favor of the inventor who desires to secure patents in other countries, namely: It provides that after a home patent *is allowed* the application may remain in the secret archives of the Patent Office for a period not exceeding *six months*, thus enabling the inventor to arrange for his foreign patents *in advance of all other patents.* But if the inventor permits the American patent to issue before he has applied for foreign patents, he loses the opportunity of obtaining them; for in most countries the patent is invalid if previously patented elsewhere; the inventor is thus deprived of the credit and emoluments that he might easily have secured. Many valuable patents have thus been lost to their inventors in European countries.

Such is the prestige and fame for ingenuity which Americans enjoy in Europe that good American inventions are in demand, and if proper steps are taken, may be quickly introduced and rendered profitable. We suggest to American inventors that they endeavor to avail themselves *of every advantage that they can* in this direction.

The expenses of procuring patents in Europe having been *greatly reduced*, the obstacle of cost no longer stands seriously in the way of the American patentee. If, however, he is unable to meet the expense, he should find a reliable partner who will pay the costs and share the profits. Arrangements of this kind have in many cases proved highly profitable to all concerned. Agreements with one partner for England, with another for France, and so on, might prove advantageous.

The following schedule shows the best countries in which to take patents:

Countries.	Patent Applications Including Agents' Fees.	Population.
Great Britain and Ireland	$100	40,000,000
Each of the British Colonies has its own patent law.		
Germany	100	45,000,000
France and its colonies	100	78,000,000
Belgium	100	6,500,000
Spain and its colonies	100	26,000,000
Austria-Hungary	100	38,000,000
Italy	100	30,000,000
Russia and Poland	250	108,000,000
Sweden	100	4,700,000
Norway	100	1,700,000
Portugal and its colonies	400	4,700,000

About the Size of It.

Regarding that "pig iron warrant" scheme, it is not at all singular, while it is worthy of note, that the parties that take stock in it, either by signing or merely giving approbation, belong to two classes; the needy and adventurous class, who took advantage of booms and the credulity of gulls and overbuilt the business, and who also never did have and never expect to have any solid bottom, compose the first class. Financiers, pure and simple, cold-blooded and keen come in as the second class, and they fill the measure, because they already have the capital made in many a scheme and deal; and with scent sharpened by past experience, they know that there will be several bags to be held by somebody at the ultimate outcome, and holding bags is not in their line. The urgent necessities of the first class, that had to come sooner or later, has been the inciting cause as well as the opportunity for springing this game, and while it is part of the game that they shall be thoroughly skinned in due process, the legitimate, well-established and reputable pig iron producers generally all over the country are expected to furnish the heaviest hides, the grand results.—[Ohio Valley Manuiacturer.

An Engineers' Club House.

Mr. J. F. Holloway, formerly of Cleveland, is one of the Board of Managers of the Society of American Engineers, which has just opened its new club-house, No. 10 West Twenty-ninth st., New York City. The club starts out with a satisfactory condition of finances, the balance in the treasury being about $14,000. The club will be social in character, and the membership will be limited to 1,000. It now has 350 members, representing every branch of engineering. The club-house is a handsome double brown stone structure, and is admirably adapted for the purpose. On the first floor is the office, waiting room, reception room, and dining room, while above is a library, the smoking, billiard and card room. Below the main floor is the wine room, the pantries, kitchen and chef's room, where the most elaborate dishes can be prepared at any hour. The officers of the club are: President, James A. Burden; vice-president, Henry R. Towne; treasurer, A. C. Rand; secretary, David Williams; Chairman Board of Managers, Andrew Carnegie.

Scribner's Magazine for May will interest readers of many and varied tastes. Men of letters, lovers of good fiction and poetry, railway men, amateur and professional photographers, and sportsmen will find articles which will strongly appeal to them. The variety and excellence of the engravings will delight those who appreciate good art. Theodore Voorhees, Assistant General Superintendent of the New York Central, contributes to the Railway Series an article of special interest to business men—a lucid and entertaining account of the vast and complicated machinery which keeps in motion "The Freight-car Service" of the country. He describes the strange wanderings of a freight car; the methods employed by the car accountant's office to keep track of the wanderers; and the use and abuse of cars, with some valuable suggestions in regard to expediting car service and readjusting the plan of payment. The illustrations show important freight yards, piers, warehouses, car works and floating trains.

FOREIGN COMMENT.

The Largest Wire Rope.

One of the largest, if not the largest, wire ropes ever made for use in this country, says the *Engineer*, was recently dispatched from the works of Dixon & Corbitt and R. S. Newall & Co., of the Teams, Gateshead. Its length is 4,560 yards, and its circumference five inches. It weighs over 23 tons, and occupied three large railway trucks. The rope has been made for the North British Railway Co., and is to be used for drawing the trains from their Queen street station, Glasgow, to Cowlairs. A wire rope has been used for this purpose some years, but this is the first one made on Lang's patent. This make of rope has been proved to be superior to any other for haulage and incline work, and we have no doubt will do credit to the makers. We understand that this firm, with a view to extend their business in the South Wales coal field, have recently established a manufacturing branch at the Windsor Rope Works, Cardiff.

The Proposed Coal Syndicate.

That the promoters of the great coal syndicate do not entirely despair of attaining their object is shown by the fact, that on Friday last, the committee formed for Lancashire and Cheshire, and which has assumed the grandiloquent title of "The Coal-owners, Lessees, Workmen's, and Consumers' Co-operative Association (Limited)," met at Manchester to consider what steps should be taken to promote the object of the Association. Mr. John Mercer, of Hallin's-green, near St. Helens, chairman of the committee, presided. After some discussion, the committee resolved to meet the promoters in London, immediately after the Easter holidays. In the meantime the movement is being closely watched by the representatives of the Miners' Trades Organizations, and although they have not yet felt it necessary to take any definite steps with regard to the matter, there is a very strong feeling against the proposed combination, which would certainly not be regarded as a movement in favor of the interests of the men.—[Iron & Coal Trades Review.

A Ship Canal for Sheffield.

Before very long a Committee of the House of Commons will have brought to its notice a bill which proposes the construction of a ship canal between Sheffield and the sea. By this scheme the Sheffield district is making a strenuous effort at what might be called its commercial emancipation. The demand has come alike from those engaged in agriculture and those concerned with manufactures, for in both cases the dearness or cheapness of railway rates and water freights has resolved itself very much into a question of business or no business. It seems now to have dawned upon many minds that canal communication with the coast affords about the only solution of the problem which has so long presented itself; while for the moment it is not at all clear that the difficulty will be made less appreciable through the as yet uncertain operations of the Railway Rates and Traffic Bill. Manchester has led the way in this important development, and now Sheffield intends to obtain a canal for sea-going vessels between that town and Keadby-on-the-Trent.—[Iron & Coal Trades Review.

Combination in the Edge-Tool Trade.

A meeting of edge-tool manufacturers, representing Birmlngham, Wolverhampton, and Wednesbury, was held April 11, at the Star and Garter Hotel, Wolverhampton, to form an association for the regulation of prices. Mr. Elwell, of Wednesbury, presided, and there was a large attendance. It was explained that for some time past the prices of numerous leading machine-made articles in the trade had been much too low, and that in the face of the reeent rapid advances in fuel, iron and steel, and other raw materials, it was impossible to continne this state of things. It had, therefore, been thought well to promote a movement for the formation of an association among makers to advance the present prices to a moderate extent, strictly in proportion to the advances in raw materials. After a long discussion, in the course of which the details were fully gone into, an agreement was signed by all the makers present accepting a new advanced list. Certain leading goods were accepted as the basis of the new list, and others will be regulated accordingly. The goods affected are exported to all the colonial and foreign markets, and the association will meet from time to time to further regulate prices, according to the state of the raw material market. This is the first time that any combination has been formed in the edge-tool trade.

Foreign Notes:—

Houstholm, Jutland, has the world's biggest electric light. It is of 2,000,000 candle-power, and has a range of twenty-six miles.

Since the 1st ult. seven works have given in their adhesion to the Rhenish Westphalian rolled iron syndicate.

A floating exhibition of Spanish goods has been organized by Count Vilana, of Barcelona, which will visit South American States.

Herr Krupp, who recently arrived in Rome, intends, it is said, to establish a branch foundry on Italian soil, following the example of Lord Armstrong. Herr Krupp has visited the steel works at Treni, which he proposes to acquire and extend for the manufacture of guns.

The Grusen works at Buckau-Magdeburg are furnishing some very heavy armor-plates for the Spezzia Arsenal, Italy. A recent consignment by railway included one steel block weighing 82 tons and another weighing 38 tons.

A flying Scotchman, the first of the new locomotives built for the fast Scotch traffic on the London & North-Western Railway, has just been turned out of Crewe Railway Works. It is said to be the finest lomotive on the railway, and has three cylinders—a new departure in locomotive building. It has also a seven-foot driving wheel, and is several tons heavier than the others. It has been constructed specially for high speed with heavy trains. The preliminary trial showed exceedingly satisfactory results.

The Cowles patents for the manufacture of alluminum alloys by electricity have been upheld by the German courts. This decision is the outcome of an action for the revocation of these patents, which was recently brought forward by Dr. H. Kunheim, of Berlin, who relied on the so-called anticipations of Sir W. Thomson (1879), Benzon (1858), Faure (1882 and 1883), and John Calvert (1856).

RECENT RECORD-MAKING.

The Ella furnace, at Middlesex, Pa., will go out of blast about May 1st in order that it may be repaired. It had a phenomenal run, making 120 tons a day.

Sarah Furnace, at Ironton, O., made 303 tons of foundry pig iron week before last. This is the largest output for one week in the history of the furnace.

A steam hammer weighing 40 tons was successfully cast in the Morgan Engineering Co.'s foundry, at Alliance, O., a few days ago. A duplicate will be cast in a few days. It is claimed they are the heaviest ever cast in the country.

During the month of March, Rosena, a furnace at New Castle, Pa., made 5,375 tons of No. 1 foundry pig iron, which amount is said to be 58 tons more than has ever been made in one month by any furnace in either the Shenango or Mahoning valleys.

On a recent Thursday afternoon the American Tube & Iron Co., at Middletown, Pa., received a cable message from Russia ordering 30,000 pounds of casing, to be sent to a particular point in the Russian oil territory as soon as possible. When the cablegram was received the iron for the tubing was in the rough at the rolling mill in York, and it was at once forwarded to Middletown. The rolls that make the pipe were speedily changed, the mill men set to work with a will, and so successful were the superintendent's efforts that the pipe was delivered at the ship's side on Friday night, and on Saturday morning was in the vessel en route to Russia. This is the quickest work ever done at the Middletown works.

The Hamilton works at Youngstown, O., are building two large blooming mill engines for the Chester, Pa., rolling mill company. The bed is 30 feet long and is extended so as to carry the countershaft all from one casting. The cylinders are 30x48, and the two engines are solidly joined together so as to act on the shaft. The links are supported centrally, and the reversing gearing is controlled by a hydraulic engine.

Perfect Combustion.

The great loss of heat and waste of fuel consequent upon a lack of the means necessary to secure perfect combustion have long been known to scientists and practical mechanics, and it has often been said that fame and fortune awaited the man who would invent a method that would utilize the waste. An experimenter named Fales is credited with having made this discovery, and exhibitions of his furnace have been given in Philadelphia with the most wonderful results. In a common cylinder stove, with a few kitchen shovels of coal, a fire was lighted, which, in a few minutes, without artificial draught, created a heat intense enough to melt cast iron, spiegel, and manganese ore. These results are accomplished by so arranging the fire that two different currents of air of different temperature pass through separate parts of the grate. A partial vacuum is created in the centre of the grate, and a cyclone in the drum of the stove, thus producing perfect combustion all over the surface of the coal.

In fifteen seconds from the lighting of the fire the drum is red hot. A few seconds more and a rapid vibration occurs in the drum, and is felt all over the room with startling effect. The cyclone in the stove is raging in full force, the drum loses its heat, and it is discovered that the air is being drawn down the chimney. Within four minutes from the time of lighting, the materials above mentioned may be melted, and yet the temperature of the room may be kept at a moderate heat. A 50-pound charge of coal will last 24 hours, so slow and so complete is the combustion. The scientists are puzzled because they can not account for these results on scientific principles. Among those who have taken a deep interest in the experiments are General B. F. Butler, General Hastings, Andrew Carnegie, and gentlemen of like standing.—[Pittsburgh Commercial Gazette.

The Steel Trust Practically Consummated.

An Associated Press dispatch from Chicago, May 2, says: There were filed with the Secretary of State, at Springfield, today, by the North Chicago Rolling Mills Co. amended articles of incorporation, increasing their capital stock from $6,000,000 to $25,000,000. The officers, directors and stockholders of the company were in session all forenoon here, and none of them could be seen. This action at Springfield, however, indicates that the proposals for the consolidation of the three companies operating in this State have been ratified and the consolidation practically arranged. It is understood that the agreement provides for the consolidation of the North Chicago Rolling Mills Co. and the Union Steel Co., and the purchase outright by these two of the entire property of the Joliet Steel Co. The new company will be known as the Illinois Steel Co. When it gets into operation it will have entire control of five of the best plants in the country. Two of these are in Chicago, one in Milwaukee, one in South Chicago, and one at Joliet, and it is believed that the consolidation will greatly facilitate the business and make it much more profitable by doing away with competition and utilizing the plant to the best advantage. It is claimed that all the works will continue to run full handed and that as many persons will be employed in connection with them as formerly.

GLASGOW is shipping machinery and steel goods to this country.

A CORNER IN TIN-PLATES.

He threw down his evening paper, bounced off a Harlem horse-car and made a bee line for the nearest hardware store. Upon his face was unmistakable marks of anxiety.

"Lemme see some tin-plates," he said to the clerk, as soon as he had recovered his breath.

"Tin-plates? Yessir—here are the only sizes we carry in stock. There ain't much demand for 'em."

"How many yer got on hand?"

"I'll see. Want to buy a lot?"

The customer nodded, and the clerk, going back into the gloom that always prevades a hardware establishment, sent the proprietor forward.

"Thirteen dozen on hand," said the boss, after consuming ten minutes in making the inventory.

"Well, how much for the lot?"

The dealer named a price.

"Is that the same as they were last week? Has there been any rise lately?"

"Not that I know of."

A smile of satisfaction overspread the face of the buyer as he handed over the amount.

As he left the shop after ordering his purchase sent to his residence, he muttered, "Now let them blasted Republicans whoop up the tariff on tin-plates as high as they blame please. It takes a mighty smart man to keep up with the times, but I've got tin-plates enough to outlast me now, tariff or no tariff."—[Time.

Recent Catalogues.

The Globe Steam Heating Co., North Wales, Pa., send us an illustrated price list of the Globe steam heater, Globe safety damper regulator and Globe hook plates for pipe coils.

The Canton Mfg. Co., Canton, O., have just issued their second catalogue, showing the merits of their justly celebrated Columbia steam heating or water boiler.

Some new and elegant effects in printing are shown by the new catalogue of the Canton Steam Pump Co., Canton, O. Each page has a neat border in light blue, while the cuts and matter are run in brown lithograph ink.

LIST OF PATENTS.

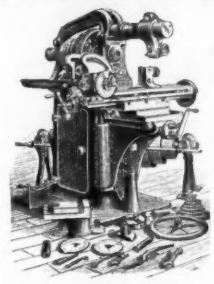
Relating to Iron, Steel, Metal, Machinery, Hardware and Mining Interests.

Reported expressly for this paper by H. T. Fisher, (late Ex. U. S. Patent Office), Patent Attorney, 34 Blackstone Building, Cleveland, O.

PATENTS BEARING DATE APRIL 23, 1889.

Blast furnaces, flux feeder for, N. A. Pratt, Atlanta, Ga.
Ceiling, metallic, L. L. Sagendorph, Cincinnati, O.
Emery wheels, instrument for cutting or grinding, W. Diebel, Philadelphia, Pa.
Iron and steel, manufacturing, J. Reese, Pittsburgh, Pa.
Metal strips for ornamental metal lattice or fence work, machine for shaping, F. H. Kindl, Chicago, Ill.
Metallic mold, N. Washburn, Boston, Mass.
Ore concentrator, W. H. Meginness, Denver, Colo.
Ore grinding mill, J. McKenzie, El Dorado, Cal.
Railway tie, metallic, A. J. Hartford, New York, N. Y.
Roller mill feeder, R. Wilcox, Milwaukee, Wis.
Shaft, flexible, T. Gare, Stockport, Chester County, England.
Welding together sections of pipe by electricity, E. L. Ries, Baltimore, Md.

BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.



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Screw Machines
KEPT IN STOCK.

No. 3 Universal Milling Machine. *No. 5 Plain Milling Machine.*

Care should be taken to destroy old catalogues. Only those of latest edition should be kept on hand. Catalogues of new edition mailed on application.

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STATIONERY, Neat, stylish and business-like.

STOCK CERTIFICATES, Elegant and "taking" in design.

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Recent extensive additions to our shops and Machinery makes our Plant one of the largest and best equipped in the country.

We are now prepared and have facilities for doing Foundry and Machinist work of every description. Shall be glad to furnish estimates on application for Engines, Boilers and other heavy Machinery.

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Steam and Hot Water.

10,000 pleased parties using an aggregate of over **12,500,000** square feet of Bundy Radiators attest to their superiority.

IF YOU DOUBT THIS

We will send the list and consider it a favor if you will write to the parties for their opinion.

Send for catalogue with new designs of **Arabesque** Radiators for **Oriental, Moorish** and other Queen Anne rooms.

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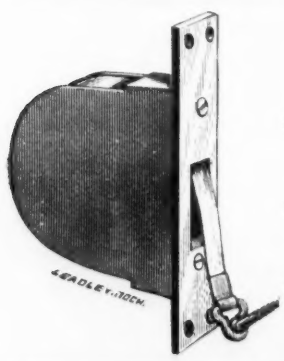
Caldwell Sash Balance



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Balancing Window Sash.

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STEEL -:- ROOFING

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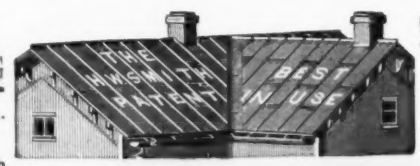
10 FOOT

Seamless Eave Trough.



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Plain, Rolled, Crimped Edge, Corrugated and Beaded Roofing, Siding and Ceiling.

PURE STEEL A SPECIALTY.

Send for Descriptive Catalogue.

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STEAM BOILERS, STACKS, SHEET IRON & PLATE WORK, OIL AND WATER TANKS.

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IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, four months): No. 1 Bessemer, $18 00@18 50; No. 1 Foundry, $17 20@17 70; No. 2 Foundry, $16 20@16 70; No. 1 Gray Forge, red short, $15 20@15 70; No. 2 Gray Forge, neutral, $14 70@15 20; No. 1 American Scotch, $17 20@17 70; No. 2 American Scotch, $16 20@16 70.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $15 00@15 50; Ohio and Southern Coke No. 2, $14 25@14 75; Ohio and Southern Coke No. 3, $13 50@14 00; Ohio Soft Stone Coal No. 1, $15 75@16 50; Ohio Soft Stone Coal No. 2, 14 75@15 50; Mahoning and Shenango Valley, $1 50@17 00; Hanging Rock Charcoal No. 1, $21 00@22 50; Hanging Rock Charcoal No. 2, $19 00@22 50; Tennessee and Alabamba Charcoal No. 1, $18 00@18 50; Tennessee and Alabama Charcoal No. 2, $17 00@18 00. FORGE—Strong Neutral Coke, $13 00@13 50; Mottled Neutral Coke, $12 50@13 00; Cold Short Coke, $13 00@13 50. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $20 00@25 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $21 00@21 50.

CHICAGO (reported by Rogers, Brown & Co.): COKE AND BITUMINOUS COAL FOUNDRY—Ohio (Hanging Rock Softeners No. 1, $18 00@18 50; Ohio (Hanging Rock Softeners No. 2, $17 00@17 50; Ohio Hocking Valley Softeners No. 1, $18 00@18 50; Ohio Hocking Valley Softeners No. 2, $17 00@17 50; Ohio Hocking Valley Silvery Pure No. 1, $17 00@00 00; Ohio Hocking Valley Silvery Pure No. 2, $16 00@00 00; Ohio (Black Band), $19 00@19 50; Ohio Jackson County Softeners No. 1, $18 00@18 50; Norton and Ashland Brands Ashland, Ky.) No. 1, $17 00@17 50; No. 2, $16 00@$16 50; Southern Coke Foundry No. 1, $16 50@17 00; Southern Coke Foundry No. 2, $15 75@16 25; Southern Coke Foundry No. 3, $15 25@15 75; Southern Coke, Soft No. 1, $15 75@16 25; Southern Coke, Soft No. 2, $14 50@15 00; Southern Coke, Grey Forge, $14 50@15 00; Local Furnaces at Chicago and Milwaukee No. 1 Foundry, $16 00@17 00; No. 2 Foundry, $15 00@16 00; No. 3 Foundry, $14 00@15 00. CHARCOAL FOUNDRY—Lake Superior No. 1 and 2, $20 00@00 00; Hanging Rock, $21 00@23 50; Southern, $19 50@20 50. CAR WHEEL AND MALLEABLE—Standard Southern No. 3 to 6, $20 50@25 50; Lake Superior, $20 50@21 00; Hanging Rock Cold Blast, $24 50@27 00; Hanging Rock Warm Blast, $22 00@24 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 75@15 25; Southern Coke No. 2 Foundry (new classification), $14 25@14 75; Southern Coke No. 3 Foundry (new classification), $13 75@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $12 75@13 25; Silver Grey, different grades, $13 00@13 50; Southern Charcoal No. 1 Foundry, $16 25@16 75; Southern Charcoal No. 1 Mill, $14 75@15 25; Southern Car Wheel, Standard brands, $21 75@22 75; Southern Car Wheel, other brands, $18 00@19 50; Hanging Rock Coke No. 1 Foundry, $15 50@16 00; Hanging Rock Charcoal No. 1 Foundry, $19 50@21 00; Hanging Rock Cold Blast, $20 75@23 75; Hanging Rock Warm Blast, $00 00@00 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@16 25; Southern Coke No. 2, $15 00@15 50; Southern Coke No. 3, $14 50@15 00; Southern Grey Forge, $13 50@14 00; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@18 00; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 00@16 00; Ohio Softeners, $17 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@22 00; Southern, $19 00@24 00. CONNELLSVILLE COKE—East St. Louis, $4 55; St. Louis, $4 70.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 50@20 00; Lake Superior Coke, all Ore, $18 50@19 00; Lake Superior Coke, Cinder Mixed, $17 75@18 25; Standard Ohio Black Band, $18 50@19 00; Southern No. 1, $17 00@17 50; Southern Gray Forge, $15 00@15 50; Southern Silvery, $16 50@17 00; Jackson County (Ohio Silvery, $18 25@18 75; Old Wheels, $18 50@19 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 25@16 50; No. 2 Foundry, $15 25@15 50; Gray Forge, $14 25@14 50; White and Mottled, $13 75@14 00; Warm Blast Charcoal, $18 00@21 00; Cold Blast Charcoal, $22 00@25 00; Bessemer, $16 50@17 00.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 70
4¼ to 6 by ⅜ to 1 inch	1 80
1¾ to 6 by 1⅛ to 2 inch	2 10
1¼ & 1⅜ by ⅜ to ¾ inch	1 80
1 & 1⅛ by ⅜ to ¾ inch	1 80
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 20

Round and Square.

1 to 1⅞ inch	1 70
2 to 2⅝ inch	1 90
2¾ to 3¼ inch	2 20
3⅜ to 4 inch	2 70
4¼ to 4½ inch	3 20
4¾ to 5 inch	3 40

Oval.

⅞ to 1¼ inch	2 10
⅝ to ¾ inch	2 30
½	2 50
⅜	2 90

Half Oval and Half Round.

1½ to 3 inch	2 80
⅞ to 1¼ inch	2 40
⅝ to ¾ inch	2 90
½	3 20
⅜	4 70

Heavy Band.

½ to 6 by ¼ and 5-16 inch	1 95
1 to 1⅜ by ¼ and 5-16 inch	2 05
¾ to ⅞ by ¼ and 5-16 inch	2 25
⅛ to ⅜ by ¼ and 5-16 inch	2 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 55
1¼ to 2, Nos. 16 to 18	2 65
1¼ to 2, No. 19	2 75
1¼ to 2, No. 20	2 85
1¼ to 2, No. 21	2 95
1¼ to 2, No. 22	3 05
15-16, 1 and 1⅛, Nos. 13 to 15	2 75
15-16, 1 and 1⅛, Nos. 16 to 18	2 85
15-16, 1 and 1⅛, Nos. 19 and 20	2 95
15-16, 1 and 1⅛, No. 21	3 05
15-16, 1 and 1⅛, No. 22	3 25
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	2 05
⅞, Nos. 19 and 20	2 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
¾, Nos. 16 to 18	3 35
¾, Nos. 19 and 20	3 45
¾, No. 21	3 55
¾, No. 22	3 65
11-16, Nos. 13 to 15	3 45
11-16, Nos. 16 to 18	3 55
11-16, Nos. 19 and 20	3 65
11-16, No. 21	3 75
11-16, No. 22	3 85
⅝, Nos. 13 to 15	3 85
⅝, Nos 16 to 18	3 75
⅝, Nos. 19 and 20	3 95
⅝, No. 21	4 05
⅝, No. 22	4 15
⅝, No. 23	4 25

Light Band.

1½ to 6 by 1⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in.	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅛ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 45
No. 15 to 17	2 65
No. 18 to 21	2 75
No. 22 to 24	2 85
No. 25 to 26	2 95
No. 27	3 05
No. 28	3 25

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 35
C No. 1, " "	2 60
C H No. 1 " "	2 85
C H Flange, " "	3 55
Extra Flange, "	3 95
Solid Fire Box, "	4 85

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 55
Shell	2 95
Flange	3 20
Marine Flange	3 70
Fire Box	4 35

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.

	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

	ct. ℔
Machinery	base price, 02¾
Tire	" 02¾
Spring	" 03¼
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

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	Net Ton.
No. 1 R. R. wrought scrap	$18 50
No. 1 wrought scrap	17 50
No. 1 Machine cast scrap	13 50
Stove Plate (free from burnt iron)	10 00
Grate Bars	8 50
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	24 00
Light sheet iron	10 00
Axle turnings	14 00
Wrought turning (free from cast)	12 50
Wrought iron, oily drillings	11 00
Cast borings	10 00
Malleable iron	11 50
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails gross tons	22 00
Old steel rails	18 50
Car wheels	20 00
Old copper ℔	10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	3
Tea Lead	3
Heavy Lead	3¼

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Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.
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Soft Steel Plates and Sheets,
CORRUGATED ROOFING.
Galvanized Iron. Patented Leveled Sheet.
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Good Second-Hand Engines, Boilers and other Machinery, Plates and Castings, suitable for use in a Rolling Mill. Give dimensions, condition, etc., in detail, with bottom prices on cars for cash. Address, P. O. BOX 323, Cincinnati, O.

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IRON ORE - -
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BY THOS. D. WEST.
Treating of Loam, Dry Sand and Green Sand Moulding, and containing a Practical Treatise upon the management of Cupolas and the Melting of Iron.
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Being Part II of American Foundry Practice.
Presenting best methods and original rules for obtaining good, sound, clean csatings, and giving detailed description for making moulds requiring skill and experience.
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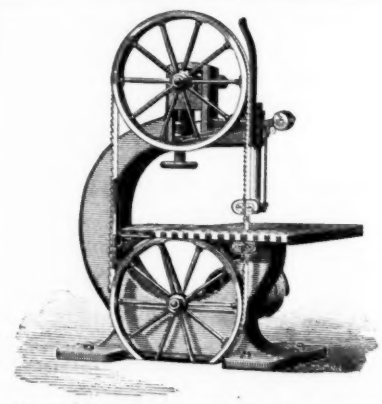
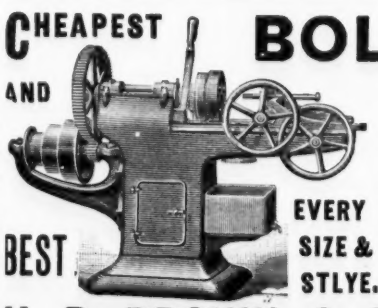


$80 will buy the best band saw in the world.
$100 will buy our new patent 40-inch band saw.
$185 will buy our new patent band re-sawing machine.
$125 will buy the best automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw. For further particulars address
STANDARD MFG. CO.,
MOORE'S HILL, IND.

H. P. Hussey. Geo. H. Pomeroy.
HUSSEY & POMEROY,
EXCLUSIVELY PIG IRON,
Strong Foundry and American Scotch Irons, Gray Forge and Bessemer Irons for steel purposes.
Room 57, Grand Arcade, Cleveland, O.

THE MORGAN MACHINE CO.,
MANUFACTURERS OF
The Hartmann Clutch Pulley, Universal Milling Machines, Special Tools and Gauges, Milling Cutters, Popular Bevel Protractor, Gear Cutting, General Jobbing.
41 West Superior St. (Viaduct.) CLEVELAND, O.

CHEAPEST AND BEST

BOLT CUTTERS.
EVERY SIZE & STLYE.
H. B. BROWN & CO.,
EAST HAMPTON, CT.
We allow One Dollar to every purchaser sending us this advertisement.

MACHINERY SUPPLY MARKET.

Anvils.

American ..... ℔ lb 9@10
Wrights ..... ℔ lb 9½

Bellows.

Blacksmiths' { Hill's ..... dis 40 / Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70@70& 5
" " " extra ..... dis 60&5@60&10
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single, ... dis 30
Shultz Raw Hide Leather Belting, double, ... dis 35
Standard, oak tanned ..... dis 55@60
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

B. F. Sturtevant's ..... dis 20
Boston Blower Co. ..... dis 35
Buffalo ..... dis 35

Borax.

..... ℔ lb 9½@10½

Chalk.

White ..... ℔ gross 50
White Crayon ..... ℔ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 40
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers ..... dis 25
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 30
" Independent ..... dis 40
" Little Grant Drill ..... dis 30
Horton's Universal & Ind ..... dis 40
National Combination ..... dis 40
Sweetland " ..... dis 40
Skinner " ..... dis 40
" Light Independent ..... dis 50
Almond Drill ..... dis 25
Morse " ..... dis 15

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" " Gear Cutters. ..... dis 15

Crowbars.

Cast Steel ..... ℔ lb 4
Iron, steel points ..... ℔ lb 3½

Drill and Drill Stocks.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1½" ..... dis 50&10
Morse Taper and Straight shank Larger than 1½" ..... dis 25
Drill Sockets ..... dis 20
Standard ..... dis 50&10
Cleveland ..... dis 50&10

Emery.

	No. 4 to No. 46 gr.	No. 54 to No. 150. gr.	Flour, F.	C. F. FF.
Kegs, ℔ lb	4 c	5 c		2½c
½ kegs ℔ lb	4¼c	5¼c		2¾c
¼ kegs ℔ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co ..... dis 40@46
H. H. Barton ..... dis 40@46

Emery Wheels.

Detroit ..... dis 50@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Union Stone ..... dis 60
Sterling ..... dis 60
Vulcanite ..... dis 15@20
Celluloid ..... dis 10
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 65@70
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3½
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ℔ keg card rate
{ Car lots ..... $2.50 / Less than car lots $2.60

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ℔ lb 10@11
Russia Packing " ..... ℔ lb 14
Italian Packing " ..... ℔ lb 13@14
Plumbago Piston ..... ℔ lb 40
Morrison's " ..... ℔ lb 50
Square Flax " ..... ℔ lb 70
Sheet Rubber ..... ℔ lb 12@24
Excelsior Rubber. ..... ℔ lb 48

Picks.

Railroads, 5 to 6 lbs. ..... $12 dis 60&5@60&10
" 6 to 7 lbs. ..... $13 dis 60&5@60&10

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 45

Rivets.

Iron, Thousand, list November 17, ... dis 50@50&10
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ℔ lb 15¼
Sisal, ½ inch and over ..... ℔ lb 13¼

Sand Paper.

B. A. & Co. ..... dis 40@40&10
H. H. Barton's ..... dis 40@40&10
New England Flint ..... dis 40@40&10
Barton's Garnet ..... dis 20

Saws.

Disston's Circular ..... dis 45
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Cicular Saws ..... dis 50
" Mill, Mulay and Drag Saws .. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts .. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "

Screws.

Wood Screws—List Jan 27, 1889.
Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 55
Machine, round head, iron ..... dis 50
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

Taps.

Cards, Hand and Nut to 2 in. ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " ..... dis 25
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in. ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12¼c	
3-Ply " 1½ lb Balls	11@11¼c	

Cotton Wrapping, 5 Balls to lb ..... 15@16c

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30

Wire.

New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ... dis 70&10@75
" " Nos. 19@26 .. dis 75@75& 5
" " Nos. 27@36 .. dis 75&10& 5
Coppered Nos. 0 to 18, market list .. dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40

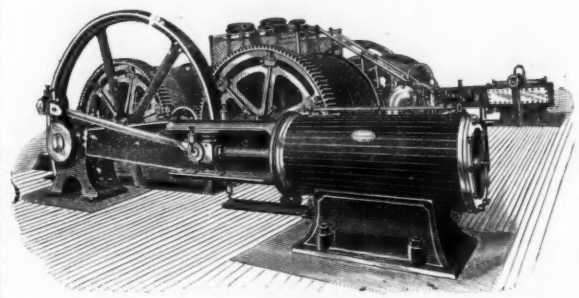
EUCHENHOFER'S
Patent Automatic Feeder
—FOR—
BOILER SCALE SOLVENTS.

Feeds regularly and automatically, so as to keep the water in boiler constantly impregnated with whatever solvent is used. Most effective in the market. Address the manufacturers,

Weinman & Euchenhofer,
NOVELTY MACHINE WORKS,
DAYTON, OHIO.

A I. BABBITT.
The only genuine Allen's Black Lead Compound Babbitt. Perfect satisfaction guaranteed. The cheapest metal made, quality considered. Address all orders to
W. L. FAY & CO., Sole Mfrs., Elyria, O.

Webster, Camp & Lane Machine Co.



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Mining Machinery,
Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.
Wire Rope Haulage Machinery,
(Endless or Tail Rope Systems.)
CORNISH PLUNGER AND BUCKET LIFT PUMPS.
Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.
Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

Lubricator for Traction, Portable and all other small Engines, pumps, etc. Single connection.

IMPROVED UNIQUE AUTOMATIC
Steam Sight Feed Lubricator
Endorsed by leading Engine Builders. The only Sight Feed Lubricator that will feed beeswax successfully. An advantage which users and builders of Ice Machines will appreciate. Manufactured under strong patents, the validity of which is acknowledged.
Active Agents wanted. Special inducements to dealers.
Our Lubricators will be sent to responsible parties, subject to trial under positive guarantee to give satisfaction.
Unique Lubricator Co., Mansfield, O.

Lubricator for Stationary Engines. Double Connection.

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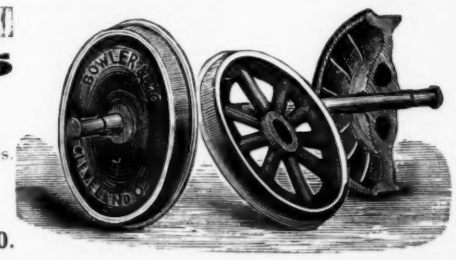
SMITH & SILK,
MANUFACTURERS OF
IRON PLANERS.
26x26 and 28x28, 30x30, with bed from 6 to 14 ft. long. Address all correspondence to
SMITH & SILK,
N. E. Cor. 8th and Lock, CINCINNATI, O.

CLEVELAND FOUNDRY.
Castings
For Machinery and Rolling Mills.
CAR WHEELS
All sizes and kinds, with and without Axles.
Chilled Faced R. R. Frogs
ST. RAILROAD TURNOUTS.
Nos. 9, 11 and 13 Winter Street. BOWLER & CO.



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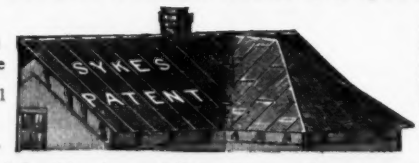
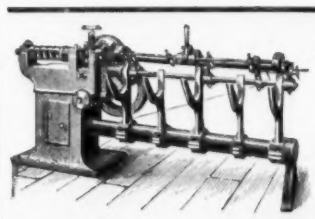
CRIMPED
SYKES' IMPROVED Best Roof in the World. Suitable for all classes of Buildings. Easy Put On.



All my Iron is Re-Rolled and Box Annealed, well Painted on both sides with Best of Paint and Pure Linseed Oil.
CORRUGATED
Send for Circular and Price List, and mention this Paper.

NILES BOILER WORKS,
—MANUFACTURERS—
STEAM BOILERS.
Blast Furnaces, Tanks, Stacks, Stills, Agitators, Car Tanks, Etc.
REEVES BROS., Props.,
Correspondence solicited. NILES, Trumbull County, O.



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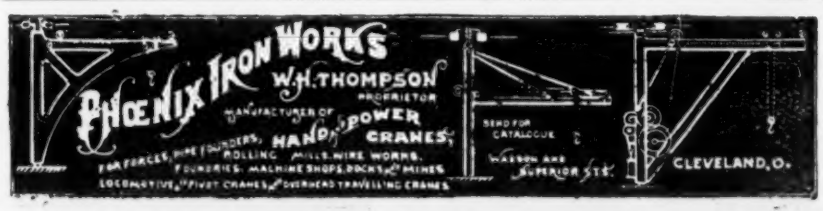
New Haven, Conn.,
BUILDERS OF
MACHINERY FOR STRAIGHTENING AND CUTTING WIRE
To Accurate Lengths Direct from the Coil.
Also Machinery for Hardware and other Manufacturing.


PHOENIX IRON WORKS
W. H. THOMPSON
PROPRIETOR
MANUFACTURER OF
HAND & POWER CRANES,
FOR FORGES, PIPE FOUNDERS, ROLLING MILLS, WIRE WORKS, FOUNDRIES, MACHINE SHOPS, DOCKS & MINES
LOCOMOTIVE, PIVOT CRANES, OVERHEAD TRAVELLING CRANES
SEND FOR CATALOGUE
CLEVELAND, O.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₱ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₱ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₱dox. $6 00@6 50
Others.....₱doz. $5 50@5 75
Full polished.....$8 00

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 70@70&10
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₱ pair 1.03
Trace, 6½-10-3.....₱ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₱ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₱ lb5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₱ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable, ₱ lb.	23	24	25	26	28.	dis 25&10@25&10&10
Putnam, ₱ lb.	18	19	20	21	23.	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₱ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₱ keg $4 00
Mule Shoes, at factory.....₱ keg $5 00

Knobs.

Carriage, japanned.....₱ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout,best makers.dis 60&10@60&10&10
Pitcher spout,cheaper goods dis 70&5@70&10&5

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@$...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₱ doz $21 00
Hatch, Tea, No. 161.....₱ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₱ doz $18 dis 25

Squares.

Steel and iron } dis 75&10@80
Nickel plated }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

JOHN A. McCONNELL & CO., PITTSBURGH, PA.

PIPE Coverings,

Hot Blast Abestos Cement, Mineral Wool and Hair-Felt Coverings of every description. The above cut shows REED'S CELEBRATED SECTIONAL COVERING.

LABORATORY
—OF—
CHEMISTRY - AND - PHYSICS.

Tests of Ores and Strengths of Material requiring expert work a specialty. Address,
J. F. ELSOM,
New Albany, Indiana.

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- HEADERS. -
FOR BOLT OR RIVET WORK.
SEATON MFG. CO.,
No. 1 Michigan Street, Cleveland, Ohio.

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WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

GEO. P. BURWELL, Gen'l Agt., 208 Superior St., Cleveland, O.
C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland, O.
A. D. BAITH, Special Agt., 208 Superior St., Cleveland, O.
R. D. BRIGGS, Special Agt., 208 Superior St., Cleveland, O.
J. E. WOLCOTT, Special Agt., Akron, O.

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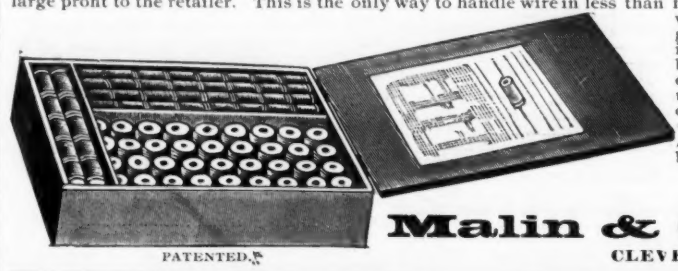
In Painted Wooden Box with Hinged Cover.

This assortment contains over 140 Spools of Black and Tinned Annealed Steel, Copper and Brass Wire, and Comprises almost every size likely to be called for. It has been put up by us especially to meet the demands of the Retail Hardware Trade, and it covers all of the most salable sizes without any dead stock. It will readily bring over $10.00 at retail and represents a large profit to the retailer. This is the only way to handle wire in less than full bundles, as it will not rust, tangle or tarnish, and is convenient for both dealer and consumer. Write us for a net price on the whole assortment, or order it from your jobber.



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HARDWARE, IRON, NAILS AND METALS
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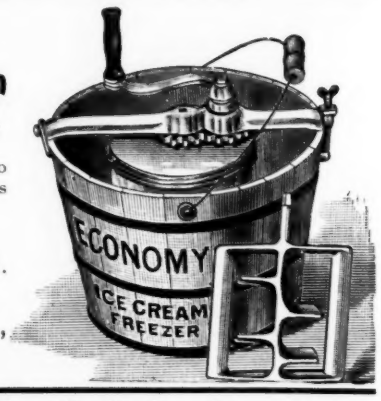

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Specially adapted for A No. 1 Boiler Plates, Boiler Rivets, Wire Rods, Stay Bolts, Stamping Ware, Nail Plates, etc. Will contract to completely erect, equip and place in operation blast furnaces, Whitwell stoves and steel plants as above. As I manufacture at my own works, everything appertaining to blast furnace and steel works construction I can guarantee promptness and satisfaction.

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MANUFACTURERS OF
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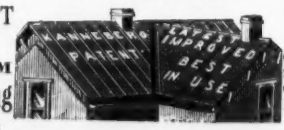

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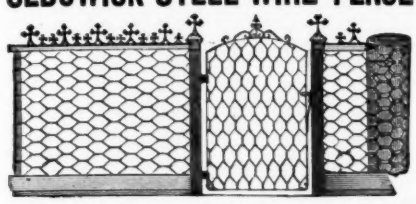

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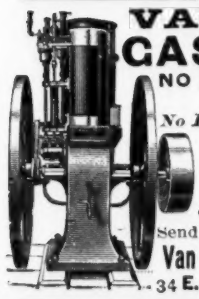

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INSTANTLY STARTED.
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Send for description and prices.
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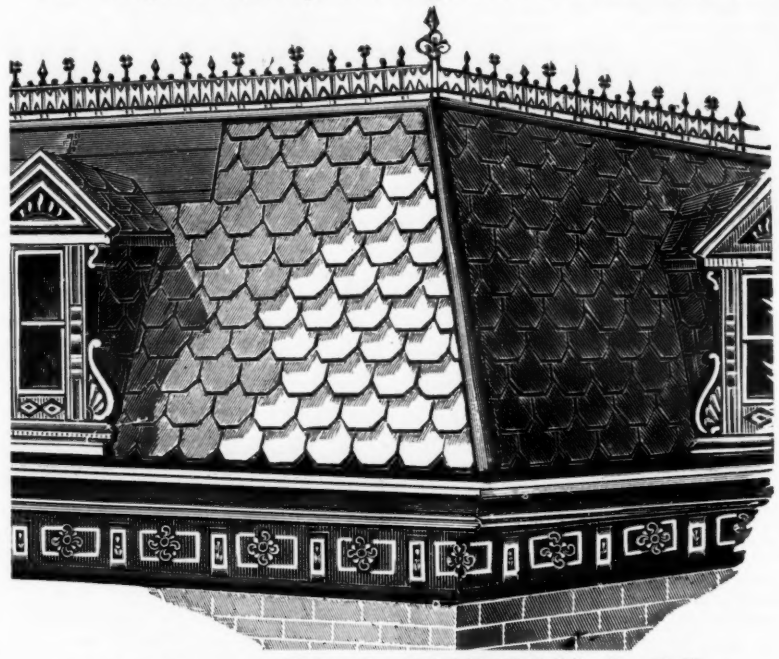

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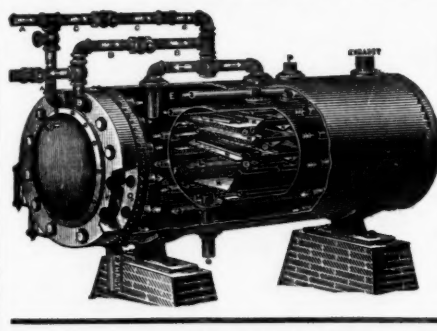

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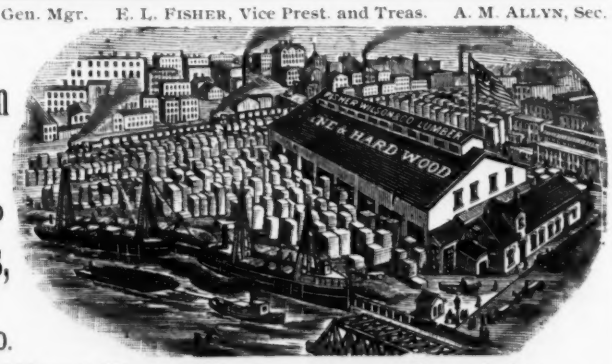

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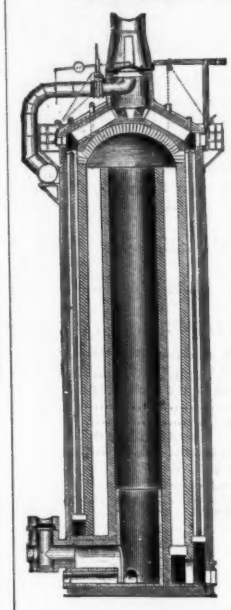

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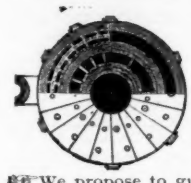

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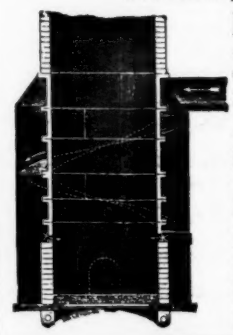

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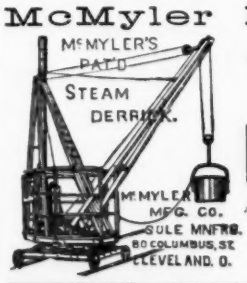

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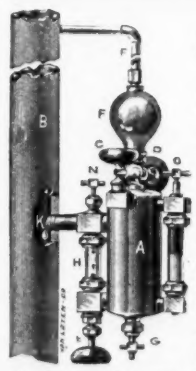

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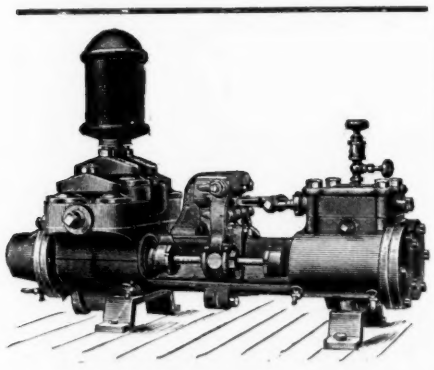

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Standard Time.
Revised March 6th, 1888.

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Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 40 p m	7 30 a m
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	5 50 a m

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:24 a. m.; 5.05 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	7 45 a m
New York Express	6 35 p m	1 35 p m
Alliance & Akron Accom	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 a m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 35 p m
Akron & Orrville Accom	9 35 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo	.....	†6 40 a m
Pittsburgh Express	†6 25 p m	.....
Youngstown Local	†8 05 a m	.....
Mahon'g div. & Pitts Local	.....	*11 40 a m
Mahoning Val. Accom	.....	†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

Depart—
Canton and Coshocton—7:30 a. m., 4:05 p. m.
Bedford—7:30 a. m., *9:00 a. m., 11:10 a. m., 2:00 p. m., 4:05 p. m., 5:45 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 7:30 a. m., *9:00 a. m., 11:10 a. m., 2.00 p. m., 4:05 p. m., 5:45 p. m., *8:15 p. m.
Kent—7:30 a. m., *9:00 a. m., 4:05 p. m., *8:15 p. m.
Arrive from—
Canton and Coshocton—9:50 a. m., 6:25 p. m.
Bedford—6:00 a. m., *7:40 a. m, 9:50 a. m., 1:05 p. m., 4:15 p. m., 6:25 p. m., *7:15 p. m.
Newburgh—6:00 a. m., 7:10 a. m., *7:40 a. m., 9:50 a. m., 1.05 p. m., 4:15 p. m., 5:35 p. m., 6:25 p. m., *7:15 p. m.
Kent—*7:40 a. m., 9:50 a. m., 6:25 p. m., *7:15 p. m.

Theatre train leaves Cleveland every Saturday night for Newburgh and Bedford 10:35 p. m.

Trains marked with * run daily. All others daily, except Sunday.

Depot at Ontario St., opposite Huron St.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA
Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 45 a m	*6 30 p m
Marietta Express	†11 15 a m	†2 30 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 15 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

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—TO—
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	Depart.
No. 62, Accommodation	† 6 00 a m
No. 72, New York Express	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Leavittsburgh Accommo	* 4 20 p m
No. 68, Pittsburgh Express	†10 50 p m
No. 68, New York Express	†10 50 p m
No. 70, Pittsburgh Local Express	†11 45 a m
No. 74, Youngstown Express	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*12 50 a m
No. 61, Pittsburgh Express	* 7 35 a m
No. 67, Pittsburgh Express	†10 55 a m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 9 10 p m
No. 13, Accommodation	† 5 25 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

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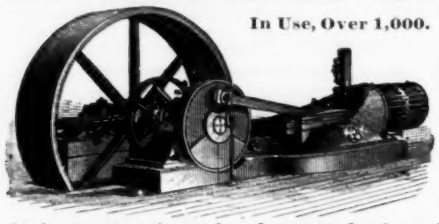

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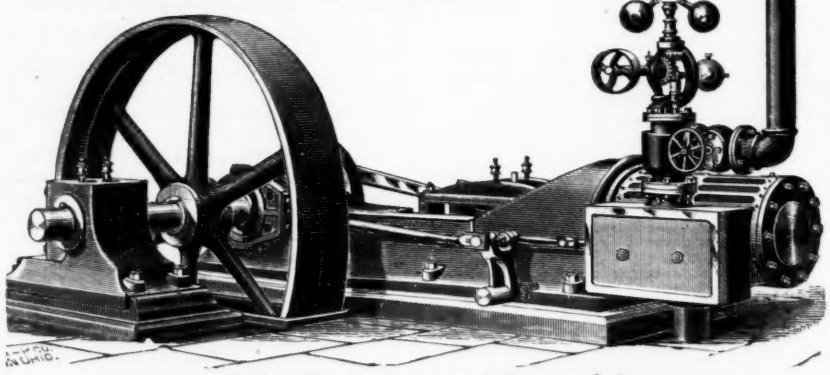

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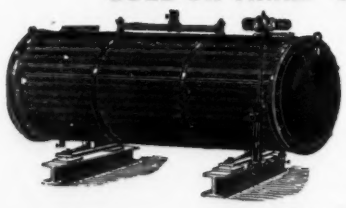

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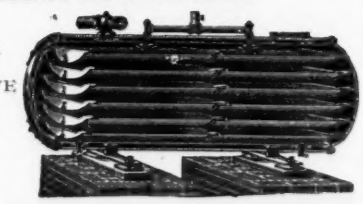

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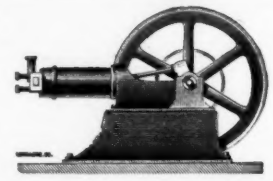

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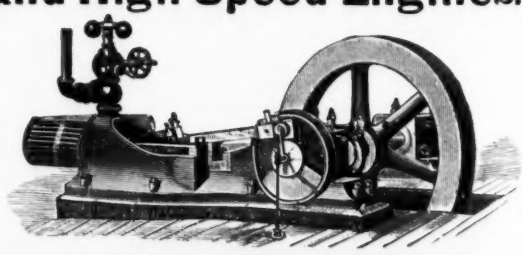

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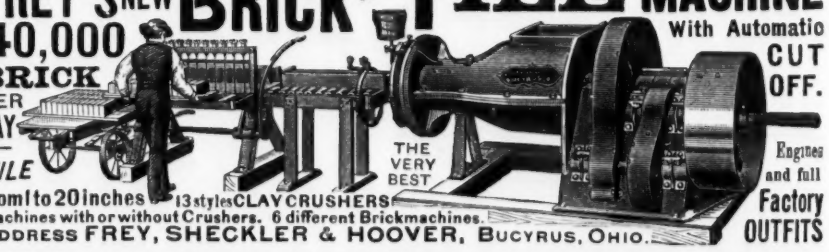

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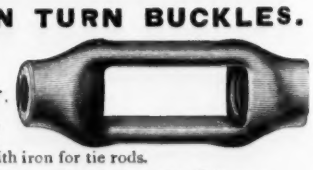

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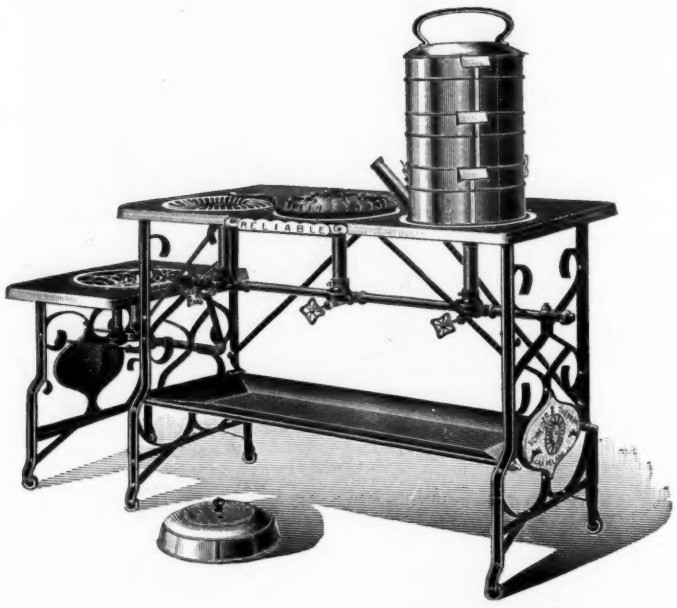

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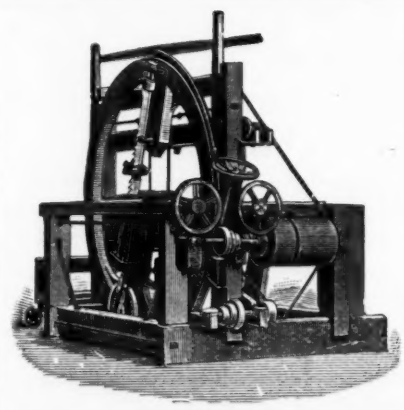

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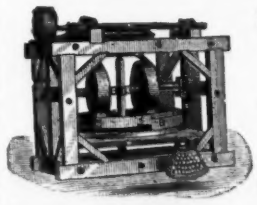

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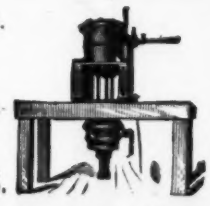

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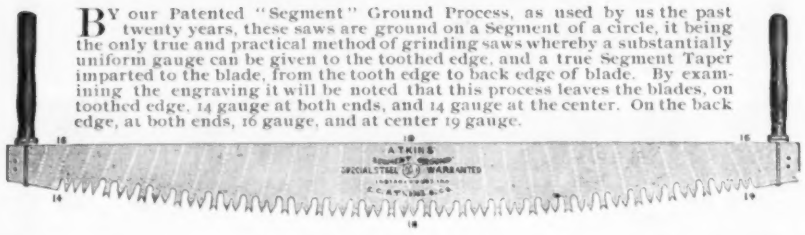

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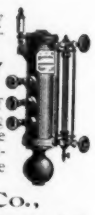

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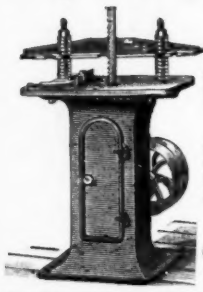

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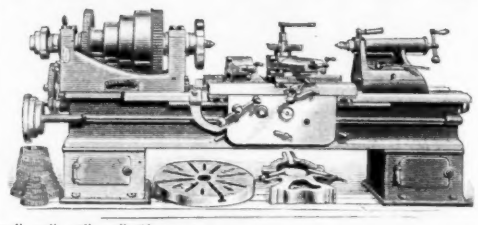

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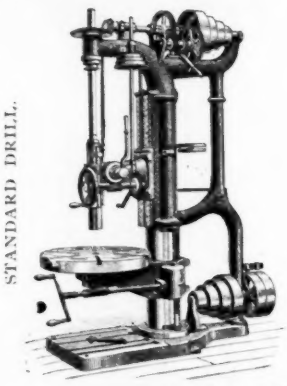

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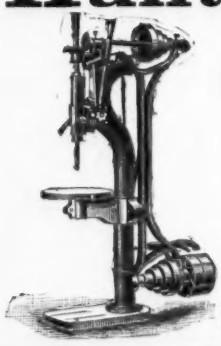

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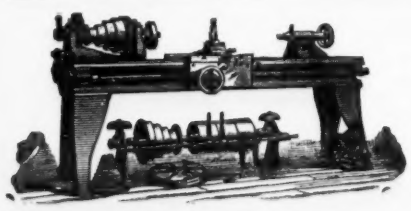

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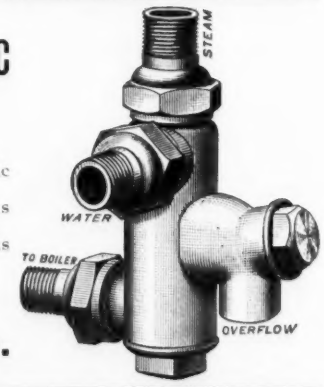

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